FOOD MANUFACTURE

Incorporating Food Industries Weekly

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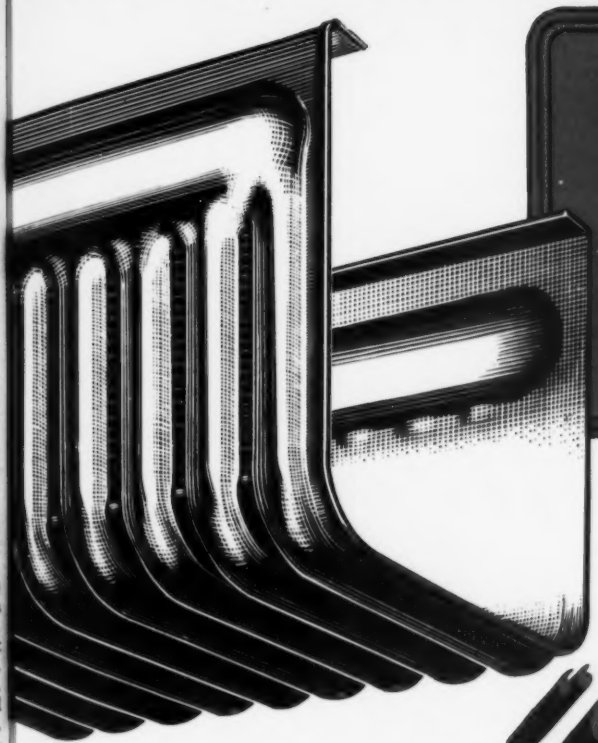

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FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

Feeding the Nation

WHEN the House of Commons went into Committee of Supply on the Ministry of Food vote on May 14 the Parliamentary Secretary of the Ministry presented a summary of its recent work. The subsequent debate savoured of an apotheosis except perhaps in the little matter of the fish.

Mr. Mabane was reassuring with regard to food stocks. Since 1939 they had been greatly strengthened by additional warehouses and increased cold storage capacity. Substantial reserves had ensured distribution on a reasonably even basis during the last twelve months. Provided home agriculture continued to produce as large a proportion of our food as during this year, the country could be confident that the national larder would continue to be well stocked. The strategy of food was not a domestic affair—it concerned all the United Nations. There was a combined staff and a common strategy. Nothing during the last year had been more important or significant than the establishment of that common strategy, including the London Food Committee, a pendant of the Combined Food Board.

Commenting on foodstuffs on the straight ration, Mr. Mabane said that there were, in general, no complaints. That there was enough meat, butter and sugar each week at the points of distribution to meet the compass of the consumer was to him a miracle. The system worked, thanks to the co-operation of the trade and the public.

The points scheme had become one of the most popular elements in the distribution plan. It enabled all, by using their points entitlement, to come by those little extras which added variety to the diet which had been tending to get into too few hands.

Mr. Mabane entered fully into the matter of fish supplies, and, with regard to their scarcity, he said that, far from attacking the Ministry, the attention of the shrewd public had been on the fish trade. The Food Industry Joint Council (which responsible body was now working in close harmony with the Ministry) deplored, as he did, the atmosphere of hysteria that on occasion had developed. He emphasised that the purpose of fish zoning was solely to save transport and had nothing to do with the better distribution of fish.

Other matters raised by the Parliamentary Secretary were concerned with the success of British Restaurants and the revival of English cooking.

Axis Concern for Post-War Nutrition

A review of "Some aspects of the problem of alimentation in view of the work of post-war reconstruction" has been presented by Professor E. Lelesz in the issue for January, 1943, of the *Monthly Bulletin of Agricultural Science and Practice*, published by the International Institute of Agriculture at Rome. The review is exceedingly general and without either depth or figures. It is mentioned here as an example of wry humour coming from an Axis source. It is pointed out that in the work of reconstruction all classes of the population should be taught in a simple manner the best means of improving their diet. "Numerous works have demonstrated in a categorical fashion that ignorance of the importance of a rational alimentation lowers health and resistance to fatigue and aggravates the poverty of the countries." It is hoped that in the future an *international specialised and permanent centre for studies on nutrition* (italics in original) may be created which "will have a decisive rôle to play in co-ordinating, following up, and amplifying the work to be undertaken". The International Institute of Agriculture is said to devote particular attention to the solution of the difficult problems resulting from malnutrition.

Biological Synthesis of Fats

This question has been reviewed and some fresh data about it have been given by G. Stampa in the *Monthly Bulletin of Agricultural Science and Practice*, Vol. 23, 1942 (December), pp. 427T-435T. It is stressed that the biological production of fats offers a potentially useful outlet for cull fruits, wastes from fruit canneries, whey, and other sources of surplus sugar for which no ordinary industrial outlet is available. Experiments performed during and just after the last war by the Berlin Institute of Fermentation Industries did not lead to the formulation of an economically efficient process owing to the heavy labour expenditure incurred by performing fermentation in a series of small trays, and the ease with which the working cultures became contaminated. In recent years experiments have been started again with *Oïdium lactis*, which is relatively resistant to infection from outside sources. In 1941 the Swede H. Fredholm found that by symbiotic culture of *Oïdium lactis* with lactic acid bacteria in milk serum a more rapid and greater production of fat was obtained than with *Oïdium* alone (*Fette und Seife*, February, 1942). The disadvantages associated with the large surfaces and high expenditure of labour have not, however, been eliminated.

From 1937 to 1940 P. G. Garoglio and R. Ciferri performed research work in Italy on *Mucor* spp. (which had never been thoroughly tested); an asporogeneous yeast, *Torulopsis lipofera*; a *Trichoderma*; and six species of *Penicillium*, including the relatively well-known *P. javanicum*, which was studied in some detail. The best nutrient medium adopted contained (per litre) 22 gms. of commercial glucose, 2·3 gms. of ammonium nitrate, 0·25 gm. of magnesium sulphate and 0·3 gm. of monopotassium phosphate. It is not stated how the requirements of vitamins B and C were met. Inoculation was followed by incubation for 3 to 60 days at a temperature between 25 and 30° C.

The importance to be attributed to the ratio of the volume of culture medium to the total surface inoculated was confirmed. Putting the total inoculated surface as 100 and the weight of dry mycelium obtained as 100, a reduction in the surface to 47—keeping the volume of medium constant—reduced the yield of lipins to 77. *Mucor* species yielded from 16·9 to 25·4 per cent. of fat; penicillia from 15·4 to 19·1; *P. javanicum* yielded an average of 18·5 per cent. of fat in 135 cultivations.

While the Mucoraceæ are richer in fat than the penicillia, the unit yield of dry mycelium given under comparable conditions as regards volume of the medium and area of surface inoculated is much less for *Mucor* than for *Penicillium* spp. The latter, in fact, give a much higher yield. *P. javanicum* seems to be the most promising species. It gave the maximum yield of fat after about 26 days' incubation, so the process of biological production of fats does not seem likely to be rapid or to avoid involving high overhead costs for rent and use of equipment.

Garoglio and Ciferri published their results in an obscure and possibly new journal: *Il lavoro agricolo e l'autarchia*, No. 1, 1940, pp. 1-31. Stampa's paper quotes some constants of the oils produced by Garoglio and other workers and gives other details.

Co-operation In Food Research

That investigation on certain aspects of nutrition is at present handicapped by lack of co-operation is pointed out by the Nutrition Society in a recent communication. Investigators may be ignorant of other work similar or related to their own; they may have difficulty in finding others who could co-operate in making their work complete; they may use different methods, the results of which are not comparable. The most striking example is that of estimates of hæmoglobin levels, which have been made by a variety of methods, some of which are by no means satisfactory. In this particular case the Medical Research Council has set up a committee with the object of co-ordinating surveys of hæmoglobin levels and some other blood examinations.

There remains, however, a wide field that is not covered by any existing organisation. In view of the importance, at the present time, of a thorough knowledge of the state of nutrition in the country, the Nutrition Society has set up a "Committee

on Nutrition Surveys" with Sir Joseph Barcroft as chairman; the terms of reference are the co-ordination of nutrition surveys dependent on (*a*) clinical, physiological and biochemical examinations of human subjects, (*b*) examinations of food budgets, and (*c*) chemical analyses of food and meals (including collective meals). It will put investigators in touch with others who are working on the same lines or would co-operate; it will supply information, recommend methods and make periodical summaries of the results of investigations. The Committee has the support of the Ministries of Health and Food and co-operation of the Services. Professor J. R. Marrack has been appointed as a director serving under the Committee, and the Society invites all who are engaged on or undertaking investigations covered by the terms of reference to communicate with him at the London Hospital.

New Butter Substitute

Before the war ends, people in this country may have the opportunity of tasting "Extrin", a new butter substitute, just marketed by an American firm after long experiments by food specialists. It is said that it looks, smells, and tastes like butter and is considered by some to be more palatable. It is a culture of lactobacilli and yeast grown in heavy cream and butter-milk, coloured with natural annatto extract and contains salt to the ratio of 2 ozs. to 10 lbs. A proportion of real butter may be added to the mixture, and is said to improve it.

The discovery was made accidentally by food chemist William Kugelmann. It was originally made as a butter flavouring for bakers. Already restaurants, bakeries and even hospitals are using the new product, but the manufacturers now propose to broaden the market.

New Scots Cannery

Tucked away in the outskirts of Inverness is a factory that may well be the forerunner of an important new industry for the Highlands, employing directly and indirectly hundreds of people, and encouraging at the same time the expansion of cattle and sheep raising in the area. "There is no reason," says Mr. Robert Harrison, manager of the firm, "why Scottish canned meats should not compete favourably with imported meats. The beef and mutton raised on these hills is recognised as equal to the finest in the world. As yet the wealth of home produce in the Highlands has barely been tapped. There is a future for fish canneries round the coastline and on the lochs. There is a steady supply of seasonable foods from the hills.

"An experimental cannery on Lake Windermere has already helped to supplement fish supplies in that area by canning perch, which can be obtained from the lake in large quantities. Similarly, the Scottish larder in peace time and in war can be supplied with the produce of the hills and glens," he added. It was for this purpose that this cannery was opened in the heart of the Highlands. Before long it proved that many delicacies, almost unknown in Southern cities, could be easily marketed in tinned form.

Venison could be had from September to January, and Scots estates were only too glad to co-operate in producing a supply of deer equal to and exceeding the demands of the cannery. As a fresh meat, venison has never gained much favour with the housewife. But canned, either as venison steak in casserole or stewed with vegetables, it is presented in its most attractive and appetising form.

Canned hare soup, which has proved popular, is another possibility.

Problem for Butchers

An important legal problem regarding the position of the meat trader who sells meat to a customer during the week and keeps it for him to call for at the week-end was raised at a meeting of the Bournemouth Association. If the meat was kept until the week-end, delivery did not take place until the customer took the joint away and, therefore, from the time it was sold until the time the customer took it away it had to bear a label with the weight and price on it. A large number of butchers were doing this, but the point was that in two or three days the joint in question would be several ounces short in weight. If the butcher *doesn't* label it he is breaking the law and if he *does* he is liable to get into trouble for the joint being short of the weight on the ticket when the customer calls for it. The butcher appears to be between the devil and the deep blue sea. The question has frequently arisen in London, but there has been no satisfactory decision of a superior court which would be binding on the country generally. The *Meat Trades Journal*, commenting on the matter, points out that "until some poor citizen has risked his savings by taking it to a High Court he cannot be quite safe—and possibly not even then. The subject is worthy of the consideration of the Minister of Food. With the warm weather approaching, the question of keeping meat becomes increasingly difficult, and we cannot think that he prefers consumers to run the risk of meat going bad; to eat it before they want to; or, now that the new M.10 is in force, chance having no ration (or only bones) by purchasing at the end of the week. Agreeing that a butcher may, at the customer's request, without risk keep in his cold room the meat which has been weighed in the presence of the customer and purchased is a simple and obvious way out".

Busier Bacon Factories

Bacon factories that are still in production are expected to work nearer to capacity as a result of the feeding-stuffs concession to pig producers. Pigs aged 16 weeks and upwards can be fed to bacon weight on boiled swill without the addition of concentrates, but farmers have been faced with serious difficulty in finding the cereals on which to feed pigs from the weaning stage to the age of 16 weeks. This problem has prevented farmers from taking as much advantage as they would wish of the recent extension of the weight of fat pigs that qualify for the top price. Curers have had to share the farmers' disappointment as they have not received as many baconers as they desired.

Thanks to favourable weather during the earlier months of the year, the Ministry of Food is able not only to give pig producers a 50 per cent. bonus on the value of their July and August cereal feeding-stuff coupons, but is able to deliver the rations and bonuses by June 30. In addition, the farrowing allowance has been doubled (making 3 cwt. per farrowing), and the limitation on the number of sows for which this allowance may be granted (hitherto 25 per cent. of the 1939 number) has been removed.

These concessions are expected to overcome to a considerable degree the difficulty at present experienced in rearing pigs to the age of 16 weeks. Farmers may also be able to increase their breeding stock and produce more litters. The outcome is expected to be a marked increase in the number of pigs raised to bacon weight, and as the Ministry of Food will probably continue to allocate more than 80 per cent. of the pigs to the curers, bacon factories can look forward to busier times. Every extra side of bacon produced will mean one less to be imported, which helps the shipping problem.

Cucumbers and Cucumber Pickles

A study of cucumbers and cucumber pickles made by L. J. Camillo, C. A. Hoppert, and F. W. Fabian (*Food Research*, 7, 5, 339) consists of a comparison between the composition of cucumber pickles and that of the fresh vegetables.

The authors, who describe the methods of pickle preparation employed by them, found that there was an increase in the total solids and a decrease in the moisture content in practically all varieties of pickles as compared with the fresh cucumbers from which they were made. In the case of sweet pickles and bread-and-butter pickles these changes were especially pronounced owing to the materials added during their manufacture.

There was a definite decrease in the protein content of the various types of pickles and also a reduction in the calcium and phosphorus contents as compared with the fresh cucumbers. The simple carbohydrates were removed during the first four days of fermentation in dill and salt-stock pickles.

The carotene content of the different lots of cucumbers increases during their manufacture into pickles. The increases range from 23 per cent. for pasteurised dill pickles to 261 per cent. for salt-stock pickles, but there was a decrease in the amount of the other vitamins studied. At the end of a six-week period a loss of about 50 per cent. was observed in the vitamin B_2, riboflavin, and ascorbic acid content, the salting process producing the greatest loss of the water-soluble vitamins.

Vegetables and School Children

Evidences of experiments of the most painstaking sort made with the object of detecting losses of vitamin C in the handling of vegetables from the plot to the dinner plate are to be found almost every week in the appropriate journals. It would be premature to say that such labour is lost, but a visit to the average restaurant, not to mention presence at a typical domestic table, involving the partaking of soggy, overcooked and tepid "greens", would suggest that it is mislaid.

It is becoming more and more agreed that scientific work is not sufficiently publicised to the man-in-the-street, and apart from the valiant efforts of the Ministry of Food in *Food Facts* he is badly supplied with readily digestible information.

A booklet, *The School Child's Taste in Vegetables*, describes an enquiry undertaken by F. Le Gros Clark and presented to the Education Committee of the Hertfordshire County Council, and deals with an interesting practical aspect of dietary problems. "You can take a horse to water but you can't make him drink", was one of the maxims beloved of the Victorians, and Mr. Le Gros Clark's investigations clearly bring out the fact that it is not much good making vitamin assays of vegetables unless you can get people to eat them.

Some 432 children, boys and girls, were invited to write an essay on the vegetables they eat, in order to ascertain their attitude to them.

Mr. Le Gros Clark carefully analyses the essays submitted, and his conclusions are that "there is no general principle underlying the distribution of likes and dislikes among any dozen or so vegetables. But there are definite trends in preference that appear to be shared by a number of children and to be social rather than physiological in nature". It is encouraging to note that he finds that "there is little doubt that propaganda does get across in some measure".

Dr. J. C. Drummond, in a foreword to the booklet, thinks that the observations indicate a line of approach to the main problem, which is almost wholly an educational one. The relation of food to health must be taught, but attention must be paid to the charge that in this country we ruin good vegetables in a gastronomic and nutritional sense by outrageously bad cooking.

Porosity Testing of Electro-Tinplate

R. KERR, M.Sc., Ph.D.

OWING to the present need for tin economy a new material, thin electro-tinplate, is coming into prominence, particularly in America. This material differs from the traditional hot-dipped tinplate in that the tin coatings are much thinner, averaging about 8 oz. per basis box, the structure of the coatings is different and there is little or no alloy layer. Some of the American coatings, however, are heat-treated so as to fuse or "flow" the coating to produce a bright finish; such coatings then have an alloy layer, and have some of the properties of a hot-dipped coating. These thinner coatings are naturally less continuous than the thicker hot-dipped coatings, and, as the corrosion resistance of the product depends to a large extent on the continuity of the coating, it is important to be able to test the continuity. With hot-dipped tinplate, carrying upwards of 1¼ lb. tin per basis box, this is conveniently carried out by means of the hot-water test described by Macnaughtan, Clarke and Prytherch.[1] When this test is applied to thin electrotin coatings, however, it is unsatisfactory. The surface of the specimen acquires a loose reddish or blackish coating, with little or no sign of pores. By suitable modification, however, the hot-water test can be made to function with thin tin coatings.

During the hot-water test an oxide film is slowly formed on the surface of the tin, and the potential difference set up between the tin oxide and the exposed steel causes rust spots to be formed at pore sites. With electro-tinplate, however, the porosity is so great that a continuous tin oxide film is unable to form, and diffuse rust formation takes place. However, by artificially producing an oxide film on the tin surface before starting the test, coatings as thin as 2 oz. per basis box can be tested satisfactorily. The oxide film on the tin is produced by immersion in hot chromic acid solution, which is known to film the tin without affecting the steel.[2] When pre-filmed in this way, electro-tinned coatings develop rust spots in 40 minutes, and hot-dipped coatings in 60 to 80 minutes, when subjected to the hot-water test.

The new tests described below were published in the *Journal of the Society of Chemical Industry*.[3] In the present article some additional information of a more practical nature is given.

Modified Hot-Water Test

Specimens of a suitable size (say, 4 in. × 3 in.) are cut out and degreased cathodically in cold 2 per cent. sodium carbonate solution. This is best done by immersing the specimen in a beaker or tank, fitted with mild steel anodes, and connecting up to a 6 volt. D.C. supply (*e.g.*, a car battery). Hydrogen bubbles are evolved from the specimen, which loosen any oil or grease on the surface. The specimen is rubbed gently with wet cotton-wool, and rinsed under the tap, and is then ready for the pre-filming operation.

Pre-filming is carried out by immersing the specimen in 10 per cent. chromic acid solution for 5 minutes at 85-95° C. These times and temperatures are not critical, but 5 minutes' immersion should be regarded as a minimum; longer immersion up to 10 minutes or more is not harmful. On removal from the filming bath the specimens are washed in running water until free from chromic acid, and finally quickly rinsed in distilled water.

Importance of *p*H

The specimen, degreased and filmed, is now introduced into the testing vessel. This may be a large beaker of resistance glass, or a copper tank, containing distilled water at 95° C. The *p*H of the distilled water must be carefully adjusted between 4·5 and 5·5, the optimum value being 5·0.

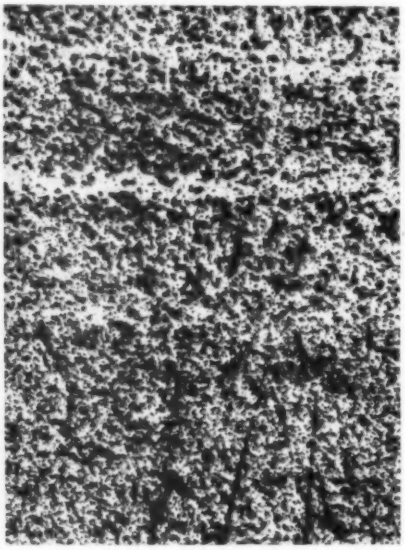
A convenient method of control is by means of an indicator, such as the B.D.H. Universal Indicator. About 30 c.c. of the water are removed in a small beaker, and two or three drops of indicator added. When the water is at the correct *p*H a definite orange or orange-red colour is produced. If an orange-yellow, yellow, or yellow-green colour is obtained, a few drops of N/20 hydrochloric acid are added to the test vessel, and a new trial made. This is repeated until the correct *p*H is obtained. Similarly, if the water is initially too acid (*i.e.*, giving a definite red tint), N/20 sodium hydroxide or ammonia should be added until the correct *p*H is obtained. The correct *p*H is of great importance, and considerable care should be taken to see that it is obtained. Carrying out the test with water at an incorrect *p*H will produce rust spots, but in insufficient number to represent porosity.

Control of Oxygen

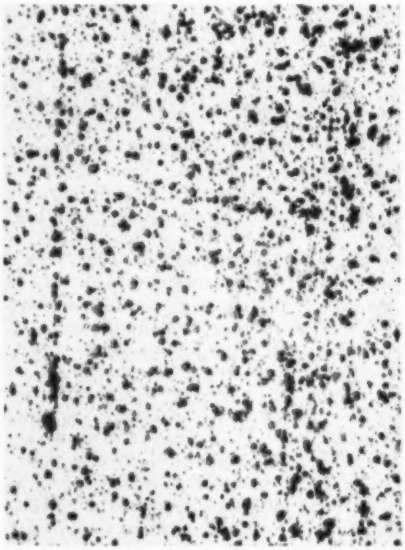
In addition to controlling the *p*H, it is necessary to ensure that there is an adequate supply of oxygen to the specimens. The rust spots are developed by the joint action of the water and the dissolved oxygen contained therein, and this oxygen must be replenished from the atmosphere as fast as it is used up. Insufficient oxygen results in the formation of diffuse black spots instead of distinct red spots; as the test proceeds these black spots overlap, and a loose powdery deposit is formed. It is essential, therefore, that the containing vessel should not be overloaded with specimens. As a guide, two specimens, size 4 in. × 3 in., carrying 8-oz. tin per basis box, can be tested in a 600 c.c. squat beaker; four such specimens can be tested in a 3,000 c.c. beaker, and six such specimens in a copper tank, having a water surface of 12 in. × 10 in. With 2-oz. coatings, half the above numbers can be tested, and, with ordinary tinplate, twice the numbers.

If the rust-spots start to turn black during the test, the condition may be corrected by the addition of a drop or two of hydrogen peroxide, or the specimens may be transferred to a second vessel containing distilled water at the correct *p*H, with a little hydrogen peroxide added. This is, however, an emergency treatment, and is not recommended as a general practice. On no account should the specimens be placed

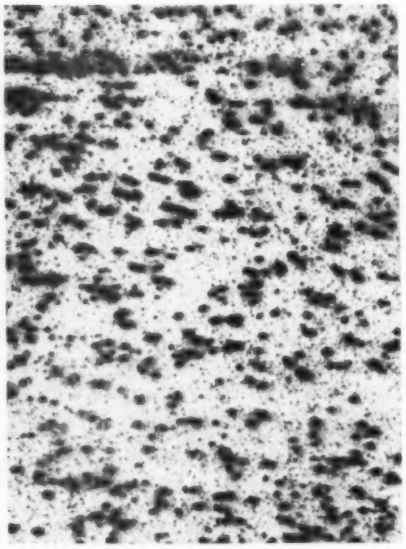
POROSITY OF ELECTRO-TINPLATE AS REVEALED BY MODIFIED HOT-WATER TEST
(Magnification ×4)



A.
2-oz. *Coating (about 20,000 pores/sq. dm.)*



B.
4-oz. *Coating (about 10,000 pores/sq. dm.)*



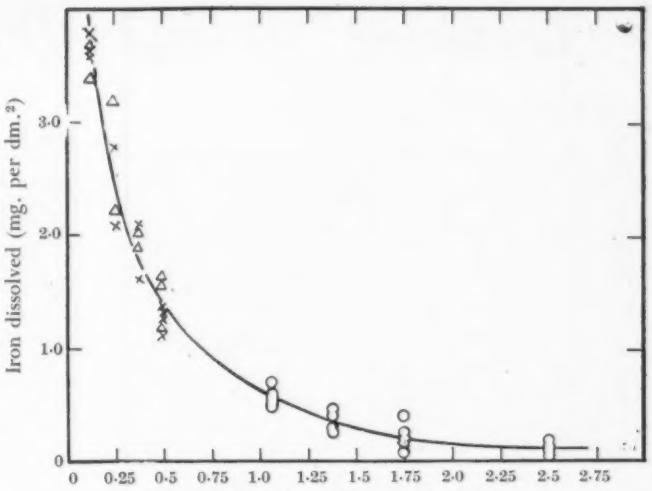
C.
8-oz. *Coating (about 5,000 pores/sq. dm.)*

D.
22-oz. *Hot-Dipped Tinplate (about 1,000 pores/sq. dm.)*

FIG. 1.

in water containing peroxide before rust spots have formed; otherwise. their formation will be inhibited.

When applied to thin electro-tinplate, the test reveals defects in the coating caused by inefficient cleaning before plating, imperfections in the steel, or inequalities in the amount of tin on the two sides. The number of pores produced varies with the thickness of the coating in much the same way as with hot-tipped tinplate, but as a rule the numbers are too great to be conveniently counted. It is therefore best to examine the pores with a hand lens, which will readily reveal inequalities and enable comparisons to be made between different plates. This is illustrated by Fig. 1, which shows the pores obtained at a magnification of 4× with 2-oz., 4-oz., and 8-oz. coatings, and with a 1 lb. 12 oz. hot-dipped coating for comparison.



KEY. O Hot dipped. Δ Electro-tin, acid bath. × Electro-tin, alkaline bath.

Thiocyanate test results on electro-tinplate and hot-dipped tinplate.

FIG. 2.

Disadvantages of Hot-Water Porosity Test

Although the hot-water porosity test gives valuable information, it has two disadvantages with thin electro-tinplate: (1) the pores are too numerous to be counted conveniently, and (2) it does not indicate quantitatively the size of the pores. The latter disadvantage is in practice not of great importance, as normally the size of the pores does not vary very greatly, but nevertheless the fact that it does not give a quantitative measure of the area of exposed steel may be considered a disability.

The thiocyanate test has, therefore, been developed; this test does not reveal individual pores, but indicates the area of iron surface exposed by discontinuities in the tin coating, the method being to immerse a specimen of standard size for a standard time in a solution containing acetic acid and hydrogen peroxide and estimating the iron which goes into solution.

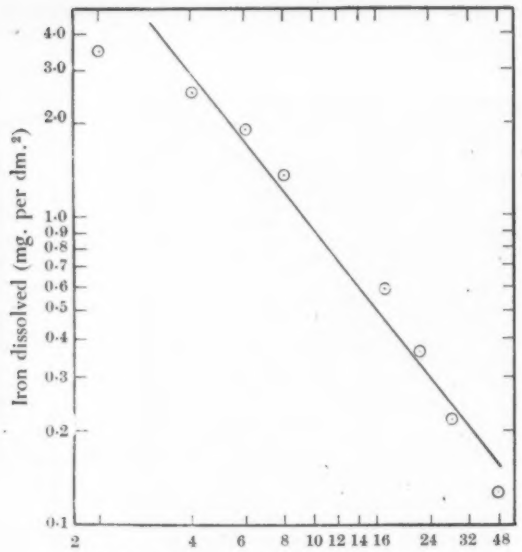
The Thiocyanate Test

A specimen size 8 cm. ×6 cm. is cut out, care being taken not to damage or scratch the coating, and then cathodically degreased in sodium carbonate solution. The exposed steel edges of the specimen are " stopped off " with hard paraffin wax, by successively dipping each edge in the molten wax, quickly withdrawing and allowing the wax to solidify. This operation is repeated twice more, to build up a thick film of wax on the edges. When the wax is quite hard the specimen is transferred to a 300 c.c. tall beaker, and 250 c.c. of a solution of composition ammonium thiocyanate 20 g., glacial acetic acid to 10 c.c., hydrogen peroxide (20 vol.) 10 cc. are added. The exposed iron is attacked by the acetic acid, the attack being accelerated by the hydrogen peroxide, which also oxidises the ferrous ions to the ferric state, producing a red coloration with the thiocyanate. After 15 minutes the specimen is removed, and the solution well stirred. The iron in the solution is then determined colorimetrically, either with a Lovibond Tintometer, or by means of Nessler glasses, using a standard solution of ferric iron, or by any other convenient method. The result of the test is reported as mg. of iron dissolved per sq. dm. of surface, allowance being made for the area covered by the paraffin wax.

Necessary Precautions

A few precautions are necesary in carrying out the test. The temperature of the solution at the start should be brought to 20° C. The strength of the hydrogen peroxide should be checked occasionally, particularly if thin coatings are being tested. This can conveniently be carried out by taking a 1 c.c. sample, diluting with distilled water, adding sulphuric acid, and titrating with N/10 permanganate. If the strength of the peroxide is markedly different from 20 volumes, a suitable correction should be made in the volume added to the solution. The test solution is not stable, and should be made up freshly for each set of determinations. (A stock solution of 20 g. of ammonium thiocyanate in 980 c.c. of water may be made up, and the other ingredients added just before the test is started.) Scratches will cause high results, particularly with electro-tin deposits, owing to the softness of the tin and the absence of alloy layer; they should, therefore, be " stopped off " with lacquer or label varnish applied with a brush.

The amount of iron going into solution varies from more than 4 mg. per sq. dm. to less than 0·01 mg. per sq. dm. according to the quality of the coatings. Fig. 2 shows the results obtained with various hot-dipped and thin electro-tin coatings, varying from 2½ lb. to 2 oz. per basis box. The electro-tin coatings were prepared under similar conditions to hot-dipped tinplate—*i.e.*, the backplate was pickled, rinsed and plated without any further treatment. It is, therefore, interesting to observe that the means of tinning (hot-dipped, acid electro or alkaline electro) has little effect on porosity



Average values from Fig. 3 plotted logarithmically.

FIG. 3.

compared with the thickness of the coating, provided the pre-tinning treatment is uniform. This is further illustrated by Fig. 3, in which the average values obtained from Fig. 2 are plotted on a log-log scale.

This test gives an over-all figure for porosity, but does not reveal the distribution of porosity; if this is desired, a hot-water porosity test may be carried out. Tests should be carried out at least on duplicate specimens, and the remarks about sampling tinplate sheets for hot-water porosity testing apply with equal force to thiocyanate tests.

The above two tests have been in constant use in the laboratories of the Tin Research Institute, and considerably more than a thousand specimens have been tested by each method. The results have shown a high degree of correlation, and indicate beyond doubt that the new tests have a definite value in testing the quality of thin electro-tin coatings.

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British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

The New War Damage Act (1943)

THE War Damage (Amendment) Act, 1943, gives different powers to the War Damage Commission in deciding whether a claim for war damage under the Buildings Scheme (which term includes buildings and immovable property, including fixed plant and machinery) of the War Damage Acts, 1941 to 1943, should be a " cost of works " or a " value " payment. The first-named method applies where premises are considered repairable; the last-named where it is judged to be inexpedient to repair. A " value payment " is an amount, the difference between the value of the premises, etc., before and after the war damage, the values to apply being those ruling on March 31, 1939; thus if there is a total loss the payment would be the value of the premises at pre-war values.

The difficulty of the Commission in deciding whether a " cost of works " payment shall be made is that if the cost of repairs, etc., in making premises fit for use as before the damage is likely to be more than the amount which would be payable if assessed as a " value " payment, then the case must be treated as a " value " payment case. To come to a decision the Commission have been required to try to visualise what the cost of repairs would be at some unknown date in the future when the work could be done and to consider the then value of the property when made good.

Simplifying Effect of Act

This new Act (1943) now simplifies matters, as the Commission can now take the cost of repairs as at March 31, 1939, in considering a " cost of works " payment, the same date as they must take for values for a " value " payment; this will doubtless result in more " cost of works " payments.

But it should be particularly noted that, notwithstanding the foregoing new appraising rules, the " cost of works " payment, when actually made, will not be the figures assessed for appraising purposes; the actual amount will be such sum as is reasonable, regard being paid to prices of materials, rates of wages, etc., building costs, current when the job is done, and the cost of employing an architect, engineer, surveyor, land agent, or other person in an advisory or supervisory capacity can be included.

Ordinarily a " cost of works " payment is made while the job is proceeding (by instalments) or when the job is finished, a " value " payment after the war (then with 2½ per cent. added), but where a person is shown as entitled to a payment under the Acts an amount may be paid forthwith to rent or purchase business or residential premises up to £800 (£1,600 if for both purposes), and payment currently may be obtained when an owner has undertaken demolition considered necessary (for example, to protect surviving parts), clearance, etc., or where a new building has been erected to take the place of the damaged building.

Whether the war damage has already occurred or does occur the new Act applies, and, furthermore, the Commission can review a determination already made if they think fit, after consultation with the interested parties.

The Commercial Use of Seaweed

ERIC HARDY

THE COMMERCIAL uses of seaweed in wartime are numerous, and by various processes many British seaweeds can prove of service at this time for such varied purposes as iodine, potash fertiliser for potato crops, agar-agar, artificial silk, paper, packing material, health foods, poultry food, and cattle foods. The red algæ (*Rhodophyceæ*) of the seashore contain gelose, the brown algæ (*Fucoids*, *Phosophyceæ*, etc.) of the sea bottom and low-tide mark contain algin, and the common green algæ (*Chlorophyceæ*) have light, strong, inodorous and non-inflammable fibres of cellulose suitable for packing material, paper or artificial silk substitutes, although these seaweeds do not contain gelose or algin.

Agar-Agar

The red algæ have been the Japanese monopoly of agar-agar, and in Britain the source for so-called carageen moss which, incidentally, is as common on the Cornish as on the Irish coasts.

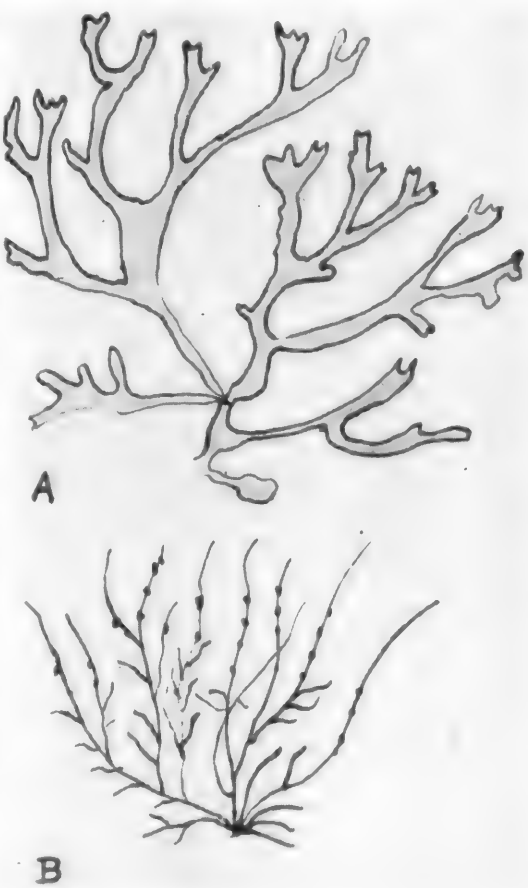
The Japanese manufacture agar-agar from a seaweed known as "Ceylon Moss", first boiling it with water and then filtering the solution, which solidifies. The solid substance is left out of doors during the cold winter to get thoroughly frozen. Finally, it is thoroughly dried in the sun. Crude but economical, this process of manufacture has altered little through many generations. There is no reason why agar-agar should be a Japanese monopoly, and why British seaweeds of suitable sort could not be utilised to replace this product. Some of our 750 British marine algæ should be suitable sources.

Agar-agar is made from *Gracilaria lichenoides*, a seaweed which does not grow in this country, but we have very closely related species of the same genus which can make a very serviceable substitute agar-agar. These are: *Gracilaria compressa*, a dull pink seaweed, an annual plant found at its best in July and August at places like Torquay, and which acts equally as well as the true Ceylon Moss. It is rather a rare, deep-water species for Britain, but it is often cast up by storms on the Devon coast; it is recognised by its tufted, disc root and the tubercles on the sides of the long fronds which grow alternately along the stem. There is also the common *Gracilaria confervoides*, whose tufted fronds are 4 in. to 20 in. long, these variable fronds not being numerous, but are round and string-like, tapering at both ends with roundish tubercles scattered and fewer in number than in the species *compressa*. Dull red in colour, turning pale yellow when exposed to the sun, this seaweed decays to a waxy white. It is a perennial and much more abundant on our southern coasts than the former.

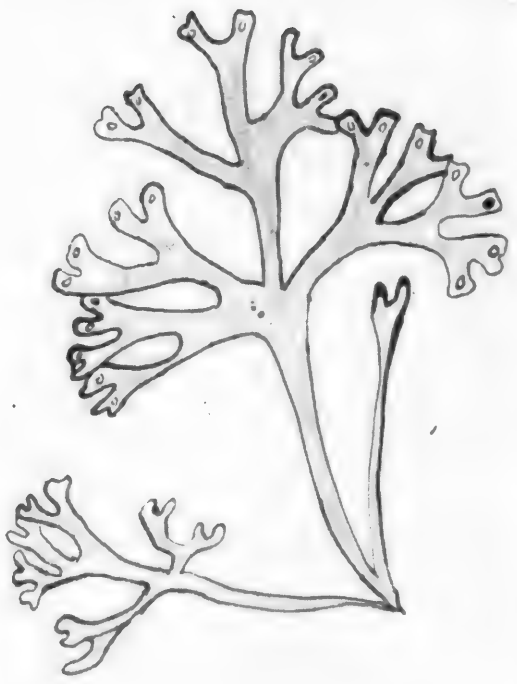
A rarer relative is *Gracilaria multipartita*, specimens of which, measuring 12 ft. long and 2 in. in circumference round the fronds, have been dredged in Plymouth Sound. Its fronds are cleft nearly to the base, and the branches are flat, numerous, and irregularly divided, soft and brittle but drying tough and shrinking; it is recognised also by large, prominent capsules which are abundantly scattered on the fronds. Its colour is a dull purple red, occasionally tinted pink and green. It is a widely distributed seaweed on our coasts. A seaweed formerly known as *Gracilaria erecta* is now placed in the Cordyle cladia group of Rhodosperms, but is also suitable for substitute agar-agar. It has stringlike branches, 2 in. long, and is widely distributed but not abundant.

Caragheen Moss

So-called caragheen moss is cut, dried, and bleached with the aid of sulphur. Although it does not dissolve or swell in cold seawater, it does so in fresh water, forming a viscous solution which is boiled for several hours or cooked under pressure to extract the mucilaginous constituents. On cooling, it sets into a yellowish-brown gelatinous mass, becoming whiter and more



A. Gracilaria multipartita.
B. Gracilaria confervoides.



Carageen or Irish moss has thirty-six varieties growing around our coasts.

viscous on acidification with sulphuric acid. A precipitate is formed when warmed, and the addition of caustic soda turns it brown, causes liquefaction and a slow precipitation.

Irish Moss (*Chondrus crispus*) or carageen has no less than thirty-six varieties growing around our coasts. It is the most varied of British seaweeds. The largest and broadest fronds are near high-water mark, especially where a freshwater stream enters the sea; the narrower fronds, in more bushy tufts, are at low water and in deep rocky pools. In all the varieties the fronds arise from a crisp, discoid base with a narrow cylindrical stem, which gradually flattens and increases in breadth to form large lobed segments; these are generally forked and have distinctly rounded axils, the tips obtuse or truncated and the sides generally crisped or curled (hence the name *crispus*). In fruit it has prominent tubercles which fall off and leave round, hollow spaces. In shady pools the colour is purple and iridescent at the tips and margins, but as a rule is dull brown-red or olive-green.

Small, insignificant parasitic seaweeds like *Leathesia crispa* are often found growing on carageen moss in Scotland and elsewhere, also the chalky *Melobesia verrucata* and *M. pustulata*, but they are of no consequence. However, a seaweed generally found growing in company with carageen on the shore is *Gigartina mamillosa*, which may be boiled to a jelly and mixed with milk, and in Scotland has been used regularly for meals. Its fronds are tufted and vary in size, and are more or less covered with little tongue-like mamillæ or processes along the margins and surface of the upper divisions of the forked segments. Dark purple in colour, it varies when exposed to strong sunlight, and may then be olive, dark brown, black, and even greenish, the fronds reaching a maximum of 4 in. in length. It is a perennial growing on most rocky shores.

The pretty membranous *Iridæa edulis* is an esculent seaweed related to carageen and with a flavour like roast oysters when cooked.

Dulse

Dulse (*Rhodymema palamata*) is an edible seaweed, which was well known to coastal peasants last century; they served it with potatoes and even ate it raw. There are five chief varieties growing on our coasts, on rocks on the shore, or on other seaweeds like the *Fuci* and *Laminaria* sorts. Its fronds may measure from 3 in. to 2 ft. in length, and they are very irregularly divided, but are generally palmated, of handsome shape with their margins entire, the bases of the fronds tapered and the tips rounded. Dull brown red or deep red in colour, it turns to pale yellow or green in decay. The varieties of dulse are: *Marginifera*, with leaflets fringing the margin; *simplex*, with a long, undivided, wedge-shaped leaf-like frond; *sarniensis*, cleft into tufts of long narrow segments; *sobolifera*, with broad fronds and narrow clefts at the end and short leaflets on the sides. The short stem of the latter soon expands into irregularly cleft, wedge-shaped branches lacerated and very jagged at the margins and tips. It is a small seaweed with fronds 2 or 3 in. long. The fifth variety, *Nicoensis*, which may be found at low tide on the rocks at Hastings, for instance, has tufted fronds arising from a narrow, horny stem, with few forkings, the segments cleft nearly to the base and rounded at the tips. This is a beautiful bright rose-pink, and it is a summer annual.

The Alginates

The brown algæ contain alginic acid as water-soluble alginates of sodium or potassium and, unless treated soon after gathering, these seaweeds decompose in the air. They are washed with weak sulphuric acid to give insoluble alginic acid and soluble mineral salts, the addition of an oxidising agent decomposing the organic bromine and iodine. This crude algin is purified by dissolving in weak alkali, removing the cellulose by filtration or decantation and reprecipitating with sulphuric acid. The alginates are used for textile sizes, calico and wallpaper industry thickeners, to make a more fluid sizing for paper, rope and twine manufacture, and for adding to tanning liquids, marine paints, briquette manufacture, asbestos and for impregnation of wood.

Synthetic Fibre

Although the production of synthetic fibre from seaweed is not new, it is only recently that it has been perfected in the Textile Department of Leeds University, the pioneer of many textile improvements. Seaweed rayon has been shown to be fire-resistant and cheaper than most other sources of rayon. It will absorb dyes and means have been found of making the filaments

impervious to soap and soda and so become washable. A piece of woven fabric, after having been soaked in petrol and being set alight, retained its strength and texture. It has little greater affinity for water than wool, so that it can be worn next to the skin under violent exercise without soaking the clothing in perspiration or producing that clammy feeling which is the disadvantage of nylon, another new textile fibre. Seaweed rayon is of high lustre and good strength, and it can be used for all the purposes of ordinary rayon in clothing, stockings and dress material.

Cattle Foods

For some time cattle foods have been made from seaweed which was imported from the Continent, but during wartime supplies have been obtained from Anglesey and other rocky coasts to augment stocks. In Germany dried, ground seaweed, like laminaria, carragheen moss and sea-laver or sea-lettuce, has been used to feed to cows and horses in limited amounts. It can be made very digestible without any harmful iodine effects, and, if horses are not being worked, seaweed meal can replace oats in their diet if fed at the rate of 2 to 2·5 kg. a day. Brocq-Rousseau, former head of the French veterinary service, replaced with seaweed the oat ration of Hungarian draught horses without noting any loss of working abilities or condition. The seaweed is best collected in autumn, the leathery bases removed, and cakes comprising 13 per cent. protein, 6 per cent. digestible carbohydrates, 1 per cent. fats, 9 per cent. fibres and 5 per cent. minerals can be obtained by washing the weed, steaming under pressure, and the expressed liquid concentrated at low temperature under reduced pressure. The salts which crystallise out are removed by a centrifuge and the brine is then mixed with the seaweed that has been treated and dried into cakes. Laminaria can be thoroughly washed and dried in fresh water with the addition of 4·5 gm. per litre of lime, and a small amount of acid to prevent the formation of mucilage, then rinsed for 15 minutes and subsequently dried in the air. It keeps like hay, and when dry shows an analysis of 52 per cent. carbohydrate, 17 per cent. nitrogenous matter, 11 per cent. fibre and 3·9 per cent. minerals. 750 gm. of it is said to equal 1 kg. of oats. In the last war the Germans used dried ground seaweed for cattle food, and also dried and chopped *Zostera marina*, the eel-wrackgrass or wigeon-grass, which is not a true seaweed, but which grows abundantly in the muddy saltings off the coasts, and which has other uses such as for packing materials and fibre production. The analysis of Zostera is 14 per cent. crude protein, 3·1 per cent. digestible protein, 1·2 per cent. fats, 20 per cent. fibre and 13·7 per cent. minerals.

Iodine Production

The production of iodine from seaweed still leaves scope for expansion. In Scotland in the nineteenth century the McLean estates had an average return from kelp off their shores of £10,000 a year, the crofters making the seaweed into kelp. A few years ago the Fuel Research Board issued a paper dealing with the carbonisation of seaweed as a preliminary to the extraction of iodine and potassium salts because the old method of kelp-burning occasioned the loss of too much iodine. The principal weed utilised is laminaria, which contains about 0·5 per cent. of iodine, and the method aims at minimum loss of iodine and also using the gaseous products for firing the retorts.

Little attention has been paid to the edible value of seaweed in this country, although the quantities thrown up on the shores by winter gales are immense. In Japan, on the other hand, cooked seaweed is a popular dish. Russian scientists have tabulated the characteristics and uses of 72 species and varieties of seaweed found in their Far Eastern waters, and something similar might be worth while among the algæ of Scotland, Wales and Ireland.

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New Oil Plant

While on his journey in Central Asia in 1939 and 1940 for the purpose of collecting fresh material regarding the cultivation and use of the soya bean, a Swedish expert, Mr. Sven Holmberg, of the big plant-improvement company Alg. Holmberg and Soener, of Fiskeby, near Norrkoeping in central Sweden, made a great find in the form of a kind of mustard plant which, on thorough examination, was found to have very valuable qualities in point of yield and, above all, oil content. These tiny seeds produce very large plants with a rigid stalk and of the height of a man. The most remarkable thing, however, is the oil content, which is about 50 per cent. compared with only 25 to 30 per cent. for the white mustard now grown in Sweden. The high oil content of the new kind, which has been named Fiskeby mustard (*Fiskeby Senap*), has been definitely confirmed by a large number of careful analyses. As proof of its high yield it may be mentioned that last summer, when the weather was considered very unfavourable for mustard-growing, a field of this mustard yielded a harvest of about 15 cwt. an acre.

There is every reason to expect a good future for the new mustard, especially as the Swedish authorities are strongly encouraging the cultivation of oil plants. Indeed, in the course of only a few years this culture has made great strides, the area under oil plants now being nearly 50,000 acres, in which white mustard preponderates. The growing of oil plants is also becoming more and more important for the national food supply; from it are obtained, for instance, raw materials for the margarine industry and special fodder for cattle.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

National Bread Production

THE PRODUCTION of a regular loaf to-day demands more constant attention than has been necessary in bread-making for very many years.

Since the addition of barley to the grist, National flour possesses a very much lower fermentation tolerance.

It is necessary, therefore, to judge the fermentation much more accurately, and finer adjustment of yeast quantities and dough temperatures is very essential.

The quality of English wheat used in the grists varies according to the area in which it is grown. Variations in flour strength are to be expected in various parts of the country because of the present high percentage of home-grown wheat.

Fermentation Processes

Three-hour fermentation processes are very widely used to-day; but whereas this may be three hours' bulk fermentation in some parts, in other places, and with other systems of working, a three-hour sponge followed by a dough straight to the divider is proving eminently satisfactory, particularly where the flour is softer. Four- and five-hour processes are also being used where the flour is stronger. Where the flour is reasonably strong it must be remembered that it contains a higher proportion of gluten, since all National flour is of a more glutenous character than white flours, milled from similar grists, would be. With such flours extra mixing is necessary in order to develop the dough correctly.

If bread of good volume with good keeping qualities is to be obtained it must be correctly fermented. For this reason dough times up to five hours may be necessary.

Much bread is under-fermented today, due to the use of insufficient yeast and dough temperatures below those required for any particular process. With machine-made doughs the finished dough temperature should be 78° F., so that when the dough is ready for the divider it will have risen to 80° F.

The yeast content should be not less than 2½ lbs. per sack for a three-hour dough, according to the plant and bakery. An adjustment of 4 ozs. per sack may make all the difference between satisfactory and good bread. Whether such an adjustment of yeast quantities is necessary can only be determined by the man on the spot. With certain flours five-hour dough finished at 76° F. will possess more tolerance than a shorter, warmer dough.

Proving

Much bread is spoilt in an endeavour to produce the volume obtained before the addition of barley to the grist. Such volume cannot be obtained except at the expense of the loaf crumb. Cutting qualities of the bread must be considered, since waste through excess crumbliness must be avoided. Further, keeping qualities are also dependent on correct proof.

Baking

Care should be exercised when handling the bread on draw-plates. Dough in the tins should not be roughly slipped or dropped on the plates, since its structure is too delicate to stand such drastic treatment. Treatment such as this causes a collapse of the loaf structure, with resultant small volume and coarse crumb. With draw-plates it is necessary to set the bread on a rising proof so that the expansion which takes place at this stage is allowed for. This will ensure a stable crumb structure in the loaf.

To produce good bread the following points should be watched:

(1) Use 5 lbs. salt per sack. Salt is an excellent dough stabiliser, and this is the quantity recommended for present-day flour.

(2) Give each dough its correct water absorption. All flours will carry from 15½ to 15¾ gallons water per sack.

(3) Malt can be used with safety, and the addition of ½ to 1 lb. per sack, according to the diastatic activity, assists good volume with a shortened final proof.

(4) Make three- to four-hour doughs finished at 78° F. and see that the temperature is maintained throughout fermentation for a five-hour dough; finished temperature should be 76° F.

(5) Use sufficient yeast and adjust the process to suit the flour. Use a sponge and dough process if it suits the flour and suitable production facilities are available.

(6) Give correct proof and maintain an even temperature in the baking and prover once scaling commences. Then handle the loaves carefully when setting or plating. Final proof in sufficient steam makes a great difference to the keeping qualities of the finished loaf and prevents waste of crusts.

(7) Bake well and then cool thoroughly.

Two Recipes—Three-Hour Processes

(1) *Straight Dough.*

Flour	280 lbs.
Yeast	2½-2¾ lbs.
Salt	5 lbs.
Water	15½-15¾ galls.

Dough temperature (finished) 78° F.
Knock-back ½ hour before scaling.*

Time: Three hours.

For a four-hour straight dough: 2 lbs. yeast. Dough temperature, 78° F.

For a five-hour straight dough: 1¾ lbs. yeast. Dough temperature, 76° F.

(2) *Sponge and Dough Process (Soft Flours Dough).*

Flour	280 lbs.	140 lbs.
Water	18 galls.	4½ galls.
Yeast	3¾ lbs.	—
Yeast food	1½ lbs.	—
Salt	None	7½ lbs.
Temperature	82° F.	80° F.

Time: Three hours, allowed to recover, and then scaled.

** In some bakeries it is found that with a particular type of plant the quickest recovery and optimum volume are obtained by cutting out the knock-back and allowing a full rise before scaling.*

MINISTRY OF FOOD.

Pioneers of Dehydration

M. SCHOFIELD, M.A.

THE IMPORTATION of dried meat in order to save shipping space brings an unintended tribute to men who, before refrigeration and the perfection of Appert's ideas for sealing off foods, saw in desiccation (or " dehydration ", to use a term which titillates our M.P.s) a method of preserving meat, vegetables and soups.

An Old Art

Dehydration is the oldest attempt by man to preserve food against putrefaction. The primitive savage, before he discovered salt as a preservative, cut his meat into thin strips, dried it in the sun, and stored it in cool caves for days when his hunting was fruitless. So there developed " jerked-beef " or the *charqui* of Chile. So too came pemmican, that North American Indian preparation of venison dried in sun and wind, pounded into a paste, and pressed into cakes either alone or with the fruit of *Amelanchier ovata* to improve the flavour. In place of venison substitute fat-free beef, and one arrives at those desiccated cakes introduced into British Navy victualling to supply expeditions. The sailors, like the public of today who have sampled the new products, did not take to this food preparation, which seemed no advance on primitive pemmican!

Early Dried Soups

From round about the year 1770 one comes across references to dried foodstuffs in Europe as well as in the United Kingdom. In provisioning Captain Cook for his voyage round the world, cakes of " portable soup " were included, these being prepared by removing fat from meat broth and evaporating to a solid looking like glue (as Sir John Pringle reminds us in his " Discourse upon some late Improvements of the Means of Preserving the Health of Mariners " : " having by long boiling evaporated the most putrescent parts of the meat, it is reduced to the consistency of a glue, which in effect it is, and will, like other glues, in a dry place keep sound for years together "). Professor Drummond and T. Macara have examined a cake prepared round about this time (" Historic Tinned Foods "—International Tin Research and Development Council). They found a flat rectangular slab (stamped with a broad arrow!), very hard and with an appearance and conchoidal fracture like glue, and containing : moisture 7·94, nitrogen 14·48, nitrogen precipitated by trichloracetic acid 3·73, protein 23·31, extractive nitrogen 10·65, total creatinine 0·79, ash 4·0 and common salt 2·1 parts per cent. The desiccated broth had undergone no change during 160 years.

For many years Navy stores included dried soups, carrots and potatoes on expeditions, although " the seamen did not take to them," despite Cook having found " portable " soup invaluable in sickness. And though tinned meat of the nineteenth century replaced it gradually in ships' stores, the better forms of dried soups gained wide favour after the important event of 1847—viz., the patent (No. 11,947) of Davidson and Symington.

Although a patented process for dehydrating vegetables had appeared as early as 1780, when Graefer salted and dried them in heated rooms, it was left to Edwards (1840) and Masson (1850) to bring the process to commercial practice. Edwards compressed boiled potatoes through perforations in plates and dried the extruded threads on steam-heated tables. Etienne Masson, on the other hand, dried vegetables on wicker, canvas or open-work trays in a current of hot air and stipulated the presence or absence of (*a*) mechanical ventilation, (*b*) lime or calcium chloride to assist desiccation, (*c*) the use of reduced pressure. The nearly-dried products of Masson were then compressed into cakes, wrapped in tin foil and stored in air-tight tins, and formed the Navy stores as marketed by Devaux in this country. Products from either process did not find favour, however. Dried carrots, potatoes and meat powder in tins were distributed to and disliked by our soldiers in the Crimea. In any case, as Professor Drummond has pointed out (*loc. cit.*), all these early methods failed to take into account the depreciation in antiscorbutic properties caused by drying. Only round about 1870, when a new craze for dehydration arose, was the drying of vegetables improved by using lower temperatures to yield a more attractive foodstuff.

With the coming of the nineteenth century, when Nicolas Appert was writing his epic work which was to relegate desiccation to an inferior place, renewed efforts were made to introduce modifications in drying processes. Sir John Sinclair in his remarkable four-volume *Code of Health and Longevity* of 1807 (written, of course, in ignorance of Appert's success with French naval stores) reviewed drying, pickling, salting and the use of ice as methods of preserving foods. He struck a note of originality in writing of charcoal, that great enemy of putrefaction, as a possible preservative agent for meat put in it " in a pounded state ". But though adsorbent charcoal was claimed to restore " tainted meat ", the method was novel rather than practical.

Curious Methods

Even stranger were other methods reviewed before the Royal Society of Arts—a society well living up to its *raison d'être* by providing a platform for discussion of applied science—and published in the Society's journal between 1868 and 1871. Professor Redwood's scheme was to coat fresh meat with paraffin wax.

The distinguished Professor Gamgee went one better by suggesting the killing of cattle by causing them to inhale " carbonic oxide ", their carcasses being then exposed to sulphur dioxide. To his further idea for feeding cattle with cinchona, mimosa bark and tannic acid with a view to preserving their flesh, one member replied : " I prefer to take bitters in another form! " R. Jones summarised the situation in 1871 in the Society's journal under the title " How Meat is Preserved ". He surveys salting, desiccation, chemical processes using bisulphites, alum or nitre, canning, etc., and includes the remark that " the desiccation process has received a large amount of attention during the last thirty years ".

Dried Ground Beef and Mutton

Equally important in the history of dehydration (especially since Australian meat was concerned) was the paper of M. B. Orr of Glasgow. Meat was then dried on a commercial scale on tinned plates which were steam-heated, the meat being ground and packed without preservative. Five lbs. of fresh meat gave 1 lb. of the dried form without losing nutritive qualities, this product being sold at 2s. a lb. in Glasgow (since there was no regular sale in London). Dried mutton from Queensland was also on the market, specimens five to six months old being found edible and well reported on by ships' captains. Although Dr. A. S. Taylor, F.R.S., had reported after examination that the product had an odour like dried fibrin or albumen and was free from acari, a suggestion of note was to cover the top of each tin with paper soaked in isinglass. Although it was at first believed that the sale of it in this country would be an infringement of Dr. Hassall's patent, it was later reported by Hassall's representatives that this was not so.

Dr. Hassall's method is reviewed in E. Smith's classic of 1879. Lean meat was dried by application of a gentle heat into a coarse powder used for soups and biscuits. Smith also refers to " Dried Hamburg Beef ", which seems to have been well known in this country, though not so extensively used in Germany or other continental countries; and to Tellier's process in which carbon dioxide was introduced after evacuation of the chamber in which meat was drying.

Though these dried meats of last century were saleable only in poorer parts of our cities, the modern forms of today are finding a wider use for confectioners and others in the cooked meats trade. Their importation, partly to replace more palatable frozen and tinned meat, is a reversion to an early process of preserving. Concentration of shipping space demands " concentrated " meat as one more example of austerity.

Science and International Trade

" The laboratory in the new age will inevitably usurp the function of the importer. Laboratory-controlled factories will give the people of the earth synthetics and substitutes of every variety. Give the chemist sunshine, water, coal, iron and sand, and—literally—he can make anything from a rubber tyre to a strawberry ice." So says Mr. Edmund F. Hubbard, stated to be one of the most outstanding of New Zealand's industrial chemists, in a little book called *The Industrial Future of New Zealand*. His dreams are Utopian (as dreams should be), and his text is self-sufficiency for all countries. His theme is the same as the one we remember hearing some ten years ago while travelling in a car between Dublin and the Seven Churches. The possibilities of the self-sufficient paradise De Valera was going to make of Eire were very convincing until we had emerged from the hypnotic state produced by the persuasive voice of our Irish companion.

Mr. Hubbard is no less persuasive. " The trend is evident," he says. " Less international trade coupled with less world-wide unemployment and a closer scientific co-operation between nations. With each able to satisfy its own basic needs, no nation need again look sideways at its neighbour. It is possible that science will not only partly eliminate international trade, but in doing so strike at the tap-root of war."

Mr. Hubbard enumerates the wealth of natural resources in his country, sometimes in a super-idealistic way and sometimes not quite accurately. He thinks that if the beneficial nature of pure apple and other fruit juices were publicised there is no reason why they should not in time partially replace the imported and entirely conventional necessities, tea and coffee. It is surprising to hear this from a country where a huge pot of tea is automatically served with every meal in a restaurant, and where its absence on the domestic board would be looked upon almost as a major event. When dealing with fruits, Mr. Hubbard does not mention the semi-tropical ones, such as passion fruit, etc., which may be grown in the North Island.

His statement that sulphur exists in large quantities, notably at White Island, is incorrect, as a large number of optimistic investors, both in New Zealand and Great Britain, discovered to their cost.

The idea of self-sufficiency is an attractive one, but it will not suit post-war conditions. There will always be countries where either industry or agriculture predominates. New Zealand has been hitherto mainly a pastoral country. True, there are many prosperous industrial concerns, but the attempt to industrialise the country would emphasise the limitations of the domestic market, although Mr. Hubbard gets over this by saying that New Zealand could support a number five times that of the present population.

Chacun à son métier seems to be a good slogan for all countries of the future.

The Industrial Future of New Zealand. By Edmund F. Hubbard. Pp. 68. Wellington, New Zealand.

African Vegetable Oils

In an article on vegetable oil prospects in French North and West Africa, *Foreign Commerce Weekly*, issued by the United States Department of Commerce, states that although peanuts are the chief oilseed of French West Africa, other exportable surpluses are produced. Palm oil and palm kernels rank second in importance. The French have estimated that utilisation of all the best oil-palm land would bring production of palm oil, in Dahomey alone, to 150,000 metric tons a year. Present production in Dahomey, Ivory Coast and French Guinea amounts annually to about 50,000 tons. French West African exports averaged 21,567 metric tons of palm oil and 81,627 tons of palm kernels in the five-year period 1934-38.

French West Africa produces a variety of other oilseeds, among them castor beans, copra, cottonseed, sesame seed, and kapok seed. In the last decade small quantities were usually exported each year, but the quantity of each oilseed exported seldom amounted to as much as 1,000 metric tons. Dahomey is the chief exporter of castor beans, copra and cottonseed, while the Sudan leads in kapok seed and Guinea in sesame. Cottonseed is also exported from the Ivory Coast.

Olive oil is the principal oleaginous material produced in French North Africa. In Tunisia, one of the world's leading exporters, the export value of olive oil has sometimes amounted to one-fifth of the value of all exports. Algeria is a substantial producer and exporter

of olive oil, while French Morocco (where the number of olive trees increased from 2,533,000 in 1924 to 7,929,000 in 1938) is at times a net exporter, at times a net importer. Tunisia normally produces upward of 50,000 metric tons of high-grade edible olive oil and 5,000 tons of olive oil residue or foots. Exports average some 40,000 or 45,000 tons, which is well in excess of Tunisia's imports of other oils and fats. Tunisia had a poor olive crop in 1941, production amounting to a mere 25,000 metric tons of edible oil and 2,500 tons of foots. The 1942 crop promised to be much better, early estimates setting production of edible oil at 80,000 metric tons and foots at 10,000 tons. Other oilseeds are grown in French North Africa, but linseed is the only other one grown in commercially appreciable amounts.

Summing up the prospects for the immediate future the article states that it cannot be expected that French North Africa and West Africa will prove during 1943 a rich fountain head of vegetable oils and fats, but the prospects for 1944 are better. Given good growing conditions and proper incentive, the writer states, French West Africa should again, by virtue of a large peanut crop, become one of the world's greatest suppliers of oilseeds, and French North Africa, if plans to expand oil seed acreage are adhered to, may become a material contributor.—Through *The Chemist and Druggist.*

Correspondence

Calcium Metabolism

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—Referring to your editorial note on Dr. J. D. Robertson's lecture on Calcium Metabolism at the Royal Society of Arts, may I make the following comments?

Originally calcium was to be added to white and not to brown bread; later to brown and not to white. First it was intended as a permanent arrangement; later as a war measure, although it has been established that the calcium intake at present is at least as large as it was pre-war.

It has been authoritatively stated that the only reason for adding calcium is the presence of phytic acid in brown bread. (Dr. Robertson's remarks are therefore quite irrelevant. The added calcium has nothing to do with optimum calcium requirement.) Why, then, was it originally decided to calcify white bread where phytic acid is not a consideration? Dr. Robertson asserts that the quantity of calcium added is negligible. Why, then, add it at all? It is quite clear that the whole calcium scheme is a face-saving expedient to cover a blunder.

Again, if there is always so much calcium in water, why add to it? As a fact, many local authorities are spending considerable sums of money to *decalcify* water, because hard water has always been considered injurious to health. I am ready to produce evidence that calcium in unnecessary quantities is a slow-acting poison and that the phytic acid theory is a "scientific "howler". But even this is unnecessary.

The experiments of McCance and Widdowson are invalid, because the number of cases is too small and the time of the experiment too short and the logic in their paper defective, because they had arrived at their conclusion before the experiment to justify the conclusion was undertaken.

In the public interest it is desirable that these experiments should be repeated by, say, four independent laboratories, each using five cases, and the same extraction of flour should be used which is at present employed in bread-making. I am quite sure that if the experiments are carried on long enough there will be a calcium balance. There need be no doubt at all about the matter. These simple experiments can definitely decide the issue.

I repeat: the whole scheme is based on a scientific "howler", and I am ready to prove this before any authoritative body.

Yours faithfully,
I. HARRIS,
Institute of Research for the Prevention of Disease.

Ministry of Food's Trading

ACCORDING to a report by Sir Gilbert Upcott, the Auditor-General, on the vote of credit appropriation account, published recently as a White Paper, the Ministry of Food's trading and subsidies cost £96,000,000 in the year ended March 31, 1942, after setting off profits of £11,000,000.

The chief losses were:

	£
Cereals	38,108,577
Meat and livestock	19,598,577
Milk	17,544,772
Potatoes	14,362,278
Eggs	7,183,609
Sugar	3,081,512
Tea	2,585,068
Animal feedingstuffs	1,935,587

The figure for milk includes £12,477,344 for the National Milk Scheme and £1,883,753 for the Milk in Schools Scheme.

The National Vegetable Marketing Company formed in May, 1941, by the Ministries of Food and Agriculture, which is to be wound up, lost £396,194 on carrots and made a profit of £107,000 on onions. Administrative expenses swallowed £106,465.

The Report deals with the experiment of fortifying white bread with vitamin B_1 and the formation of Flour (Accessory Factors), Limited, to control and manufacture aneurin (synthetic vitamin B_1). The Ministry of Food undertook to meet the cost of factories and other costs.

Subject to the disposal of stocks and to liability for capital expenditure, the total net cost of the scheme to the Ministry of Food was approximately £300,000.

Up to March, 1942, the Ministry of Food spent about £1,900,000 on wartime meals, mainly for British Restaurants.

At the end of January, 1943, 1,906 British Restaurants were in operation. The Ministry of Food meets approved deficiencies, and the profits are its disposal. This question is at present under consideration.

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, May 1, page 163.

No.	Date. 1943.	PRICE FIXATION ORDERS
144	Jan. 29.	Fruit (Canning, Bottling and Freezing) (Control and Maximum Prices) Order, 1943. (See January, 1943, List.) Revokes S.R. & O. 1942 No. 1680. S.R. & O. 1942 No. 87 as amended is also revoked with the exception of paragraph (1) of Article 14.
172	Feb. 4.	Amending the Salmon (Maximum Prices) (No. 2) Order, 1942, and the Salmon (Distribution) Order, 1943.
181	,, 6.	Pearl Barley (Control and Maximum Prices) Order. Revokes S.R. & O. 1942 No. 946.
183	,, 6.	Amending the Potatoes (1942 Crop) (Control and Prices) (No. 2) Order, 1942, and revoking Directions supplementary thereto. Revokes S.R. & O. 1942 Nos. 2307 and 2517.
212	,, 10.	Amending the Fish (Maximum Prices) (No. 2) Order, 1942.
226	,, 11.	Amending the Bread (Control and Maximum Prices) Order, 1943.
235	,, 15.	Green Onions (Maximum Prices) Order. Revokes S.R. & O. 1942 Nos. 476, 608, 1657, 1855 and 2525.
236	,, 15.	Vegetables and Vegetable Products (Canning, Bottling and Freezing) (Control and Maximum Prices) Order. Revokes S.R. & O. 1942 Nos. 88 and 559.
263	,, 20.	Smoked Salmon (Maximum Prices) Order. Revokes S.R. & O. 1942 Nos. 956 and 1561 in so far as they relate to Smoked Salmon.
292	,, 25.	Meat Feeding Stuffs (Control and Maximum Prices) Order.
299	,, 26.	Amending the Canned Meat and Canned Soup (Control and Maximum Prices) Order.
319	Mar. 2.	Amending the Potatoes (1942 Crop) (Control and Prices) (No. 2) Order, 1942.
		FISH
227	Feb. 12.	Amending the Fish (Port Allocation Committees) Order, 1942.
		FRUIT
5	Jan. 8.	Fresh Fruit and Vegetables (Restriction on Dealings) Order. Revokes S.R. & O. 1941 No. 1455 and 1942 No. 1043. (Also amends Orders dealing with Apples, Bananas, Cherries, Cucumbers, Leeks, Lemons, Onions, Oranges, Pears, Plums, Rhubarb, Soft Fruits and Tomatoes.)

No.	Date. 1943.	GENERAL
156	Feb. 1.	Directions, under the Food (Inspection of Undertakings) Order.
213	,, 10.	Livestock (Sales) Order. Revokes S.R. & O. 1940 Nos. 40, 387 and 1270; 1941 No. 806.
214	,, 10.	Livestock (Sales) (Northern Ireland) Order. Revokes S.R. & O. 1940 Nos. 47, 388, 823 and 1271; 1941 No. 807.
290	,, 25.	Licensing of Establishments Order.
291	,, 25.	Local Distribution Order.
		MANUFACTURED AND PRE-PACKED FOODS
68	Jan. 14.	Order, prescribing an Appointed Day under the Manufactured and Pre-Packed Foods (Control) Order, 1942, and giving Directions supplementary thereto.
		MILK
184	Feb. 7.	Amending the Milk (Scheme of Supply) Order, 1942.
185	,, 7.	Amending the Milk (National Scheme) Order, 1942.
233	,, 12.	Amending the Milk (Control of Supplies) Order, 1942, and the Milk (Control of Supplies) (Scotland) Order, 1942, and giving Directions supplementary thereto.
298	,, 26.	Milk (Use of Bottles) Order.
		OILS
211	Feb. 10.	Cod Liver Oil and Veterinary Oil (Control) Order. Revokes S.R. & O. 1939 No. 1885.
		POINTS RATIONING
173	Feb. 4.	Amending the Rationing (Personal Points) Order, 1942.
175	,, 5.	Amending the Food (Points Rationing) (No. 2) Order, 1942.
		RATIONING
182	Feb. 6.	Amending the Butter, Margarine and Cooking Fats (Rationing) Order, 1942; and the Cheese (Rationing) Order, 1942.
272	,, 22.	Directions, supplementary to the Feeding Stuffs (Rationing) Order, 1942.
		TRANSPORT
239	Feb. 16.	Transport of Onions. Direction. Revokes S.R. & O. 1942 No. 1844.

Flour Quality and its Control

The emergency measures relating to flour which have been introduced since the commencement of the war require that the routine pre-war tests for flour quality shall be supplemented by evaluations of nutritional and other factors which have no bearing upon baking quality. The aim of this article is to review the effect which the wartime flour regulations have had upon the "quality" and the nutritive properties of flour, and also to examine the extent to which they have called for an extension and a revised interpretation of the analytical data obtained in a cereal laboratory.

A. J. AMOS, Ph.D., B.Sc., F.I.C.

THE TERM "quality" applied to a foodstuff often has reference to its chemical composition and hence indirectly to its value as a food. It is in this sense that the term is usually interpreted in the phrase "not of the nature, or not of the substance, or not of the quality" occurring in Section 3 of the Foods and Drugs Act. Doubtless, the "quality" of a flour would be appraised by nutritionists upon this same basis, but in the milling and baking industries flour quality is assessed not upon nutritional value but upon physical attributes.

The two main criteria by means of which a miller or a baker judges the quality of a flour are dough behaviour and colour, and in pre-war days, therefore, the cereal chemist directed his routine tests to measuring those properties of a flour which influenced either its colour or its capacity for producing a well-risen loaf. In the author's laboratories the tests usually applied in the routine examination of pre-war flour were determinations of moisture, ash, protein, diastatic activity, grade colour and bleach, and these were supplemented by a critical baking test performed by an experienced test baker.

Analytical Tests for Flour Quality

In order that some of the effects which are discussed later may be fully appreciated, a brief explanation of the principle and the significance of some of the routine flour tests may be desirable.

The ash content of the skins of the wheat grain is something like thirty times as great as that of pure endosperm and hence, in the absence of extraneous mineral matter, the ash content of white flour was an indication of the relative proportions of endosperm and branny matter which it contained.

Since the "grade" colour of flour is largely governed by the proportion of branny material present, the ash of flour served as an indirect measure of the colour. When a flour contains added mineral matter, as does self-raising flour, for example, the ash naturally ceases to be correlated with colour.

The major proportion of the protein of flour consists of gliadin and glutenin, two proteins which, in the presence of water, give rise to a complex known as gluten, which exhibits distinct elastic properties. It is to the formation of gluten that wheaten flour owes its peculiar property of yielding an elastic dough and thus of producing bread. Flour contains a proportion of proteins other than gliadin and glutenin, but the total protein content of flour is nevertheless a useful guide to the potential gluten content and is thus a factor of distinct importance in the assessment of baking quality.

Diastatic Activity

The diastatic activity of a flour is an index of the extent to which the flour can produce sugars from its starch and yield a reserve supply of fermentable material for the yeast responsible for the aeration of the dough. Unless the supply of sugar is maintained at a satisfactory level throughout the fermentation period, the yeast will be unable to produce sufficient gas for proper aeration. In the laboratory the diastatic activity is measured empirically by determining the proportion of reducing sugars which are present in a flour after it has been incubated with water for a definite time at a controlled temperature. This test is known as the "maltose" test and the value which it furnishes is referred to as the "maltose figure".

Flour Extraction and Fortification with Vitamin B_1

An early wartime flour Order was that enforcing the fortification of statutory N.S.R. white flour with synthetic aneurin. The addition of the prescribed proportion of this compound more than doubled the vitamin B_1 content of a flour, but it had absolutely no effect upon the colour or the baking properties. Nevertheless, when the change-over to fortified flour occurred, it became necessary to supplement the normal flour tests by a vitamin B_1 assay in order to effect a control upon the addition and distribution of the aneurin. Later an Order was introduced which raised the flour extraction to 75 per cent. This increase in extraction naturally led to a slight falling-off in flour colour, but with the grists then being used it had no marked effect upon baking quality and did not call for additional or modified tests in the laboratory. Thus, prior to the introduction of the 85 per cent. Wheatmeal Order about a year ago, there had been no radical alteration in the nature or baking quality of flour, and the only additional test required for its control was a vitamin B_1 assay.

The position became quite different, however, when the Order appeared compelling millers to mill only to 85 per cent. extraction. For some time these 85 per cent. products were made by running into the white

flour sufficient wheatfeed stocks to make up the extraction, and, in consequence, the resulting meals contained an appreciable proportion of coarser branny matter and were comparatively high in ash and fibre contents. These changes in the composition of flour were reflected in baking behaviour; doughs exhibited less spring and life with a consequent reduction in oven development. Proper attention to fermentation conditions enabled good palatable loaves to be produced, but these were definitely more of the " brown bread " type and tended to stale more quickly.

The appreciable change in the nature of flours occasioned by the raising of the extraction to 85 per cent. necessitated extension of the tests employed for routine examinations in order to maintain effective control. The additional tests adopted were two—the determination of fibre content and the investigation of granularity by means of standardised sieving tests. At first thought it might be assumed that, since the extra fibre was derived from non-endosperm fractions of the grain, the level of the fibre content of a flour could have been assessed from the ash content. This was not so. Certain wheatfeed stocks which may be segregated for inclusion in the 85 per cent. flour are distinctly fibrous in nature but are comparatively low in ash content.

The value of these two additions to the routine tests of flour is clear from the manner in which they revealed the marked changes in the nature of 85 per cent. flour which occurred subsequent to their introduction. The fibre contents of flours in the early days of the 85 per cent. wheatmeal Order usually ranged between 0·6 per cent. and 0·9 per cent., whereas nine months later figures of 0·4 and lower were quite common. The early samples gave 2 per cent. to 4 per cent. tails of a 32 G.G. sieve and 8 per cent. to 11 per cent. throughs of a 32 G.G. which tailed an 8 silk, but to-day most of the flours give no tails on a 32 G.G. and less than 2 per cent. tails on the 8 silk.

Although the addition of aneurin to flour ceased with the introduction of the 85 per cent. extraction Order, the determination of vitamin B_1 content was retained as a routine test, since the natural B_1 contents of the 85 per cent. products were expected to attain a certain level (1 I.U. per gram). In the early days of 85 per cent. extraction, vitamin B_1 assays were made also upon the wheatfeed stocks available in many mills in order that the most suitable of these might be selected for inclusion in the 85 per cent. meal.

Latest Fortification and Dilution Schemes

Some months ago, millers were instructed to fortify their 85 per cent. flour with calcium carbonate in the form of *creta præparata* at the rate of 7 ozs. per sack of 280 lbs. This addition had the effect of increasing the calcium content by rather more than 60 mg. per 100 gms. of flour and was designed to alleviate the calcium deficiency of the wartime diet. More recently, further additions to flour were made compulsory, and to-day 85 per cent. flour has to contain, in addition to the *creta præparata*, 2 lbs. of milk powder per sack and 10 per cent. barley, rye or oats, or a mixture of these cereals. The inclusion of *creta præparata* has no significant effect upon either the colour or the bread-making properties of flour, and the presence of 2 lbs. of milk powder per sack, although tending to increase slightly the tightness of the dough, is not detrimental to baking quality.

The inclusion in flour of the non-gluten-containing cereal diluents, however, does undoubtedly slightly but definitely impair flour quality. This is only to be expected, but it is gratifying to find that, when well-milled diluted flours are given proper attention in the bakery, the effect of dilution upon bread quality is not as great as had been anticipated in many quarters. Since cereals other than wheat do not yield any dough-forming gluten when mixed with water, their addition to flour is equivalent to diluting the flour with an inert material and thus reducing its gluten content. The dough yielded by a diluted flour is naturally, therefore, less springy and lively than one from the corresponding undiluted flour and consequently fails to develop so well in the oven. The crumb of the final loaf is closer in texture and there is a tendency for the bread to stale more quickly.

Dilution and Baking Quality

The extent to which the baking quality of a flour is impaired by the addition of a diluent depends upon the type and condition of the cereal which is employed, and also, of course, upon the efficiency of the milling. Tests in the author's laboratory suggest that, when the admixed cereals are in sound condition, barley and rye are less detrimental than oats, and barley least of all. It is fortunate that the order of effect is in this direction, since barley is the diluent which is most widely used. When 10 per cent. of sound barley, together with 2 lbs. of milk powder per sack, are included in well-milled flour there is a detectable decrease in the liveliness and spring of the dough, but the deterioration is not sufficient to cause serious trouble in the bakery nor to demand pronounced modifications in the bakery technique. There is some reduction in loaf volume, but this is not excessive, and the bread, if properly made, is still satisfactorily aerated. The effect of the additions upon crumb colour varies, but in well-milled flours is not great.

The diluting effect of the non-gluten-containing cereals also causes a slight decrease in the strength of the flour to which they are added, but two other factors contribute to a considerable degree to the reduced strength of the present-day flours. The proportion of weak English wheat which has to be included in the blend has been raised, while Manitoba wheat, which is the only " strong " wheat in current grists, is appreciably inferior in strength and carrying power to similar wheat of previous seasons.

It may be said, therefore, that in general the quality of the bread furnished by 85 per cent. flour, fortified with *creta* and diluted with a non-wheaten cereal, is good but not quite up to the standard of that which could have been obtained from the same flour in the absence of the additions.

Analytical Control of Present-Day Flour

The later flour regulations have added to the work of the chemist engaged in controlling flour quality; he must now supplement his routine tests by analytical determinations of *creta præparata* and of milk powder in order to control the proportion and distribution of these substances in the flour. It should be noted, however, that when both these substances are present, the control of the *creta* addition must be effected by a method other than that depending upon the determination of calcium content, since the calcium introduced by

the milk powder is equivalent to about 1 oz. of *creta* per sack.

A knowledge of the proportions of *creta* and of milk powder present in a flour is required also in order to enable the data obtained from certain of the standard routine tests to be fully interpreted. For example, prior to the introduction of fortification with *creta* and milk powder, the ash content of a flour was an index of the relative proportions of endosperm and of branny matter present, and was thus a guide to the efficiency with which the milling process had been performed. At the present time, however, the application of the ash test unsupported by supplementary tests provides no indication of the quality of a flour, since the ash obtained contains not only the inorganic constituents of the flour but also the *creta præparata* and the mineral matter of the milk powder. The prescribed proportions of *creta* and milk powder raise the ash content by about 0·2 per cent., and, if no variations occurred in the proportions in which these materials were present, the ash figure of flour could be corrected by this amount. It is impossible, however, at this stage to guarantee absolute constancy in the degree of fortification, and consequently in order to arrive at the true ash content of a flour it is necessary to make determinations of the amounts of *creta præparata* and of milk powder which are present.

The "Maltose Figure"

When the "maltose test" is applied to flour containing milk powder, the reducing sugars determined at the completion of the incubation will include the lactose present in the milk powder. Because of this, the "maltose figure" of flour containing 2 lbs. of milk powder per sack is too high by about 0·4 per cent. This effect has a bearing upon the interpretation to be applied to maltose figures on the lower and upper border lines of the accepted safe range (1·5 per cent. to 2·3 per cent.). Thus, a maltose figure of 1·6 per cent. would normally be passed as satisfactory, but, in a flour fortified with milk powder, such a figure would correspond to a true maltose figure in the flour of about 1·2 per cent., and this would certainly not be accepted as a safe figure for commercial work.

Protein Content

The replacement of 10 per cent. home-grown wheat by one of the prescribed cereal diluents will normally reduce the gluten content of the flour by about 1 per cent. Although the diluents do not yield gluten, their protein contents are nevertheless of the same order as that of native wheat, and hence the reduction in gluten content which follows dilution is not accompanied by a similar decrease in total protein. Dilution with 10 per cent. of cereal is not likely to alter the protein content of a flour by more than about 0·2 per cent. and the change may actually be an increase. The presence of the prescribed proportion of milk powder will raise the protein content of the flour by about 0·25 per cent., and hence it is quite possible for the sum effect of dilution and fortification with milk powder to raise the protein content by about 0·5 per cent. and at the same time to reduce the gluten content by 1 per cent. The total protein content of diluted and fortified flour is not, therefore, such a reliable index of gluten content as is the protein content of undiluted flour. The loss of correlation between these two factors caused by dilution and fortification is not sufficient, however, to destroy the value of the protein test as an aid to the control of flour quality.

The full control of flour quality to-day, therefore, requires the application of the following tests: moisture, ash, protein, diastatic activity, grade colour, bleach, fibre, vitamin B_1, granularity, *creta præparata* and lactose. Comparison of this list of determinations with those enumerated earlier for the control of peacetime flour will reveal that the wartime flour regulations have necessitated so far the adoption of five additional tests for the control of flour "quality". In addition, it has been necessary to modify to some extent the technique and basis of assessment employed in the test bakery.

The information furnished by these extended routine tests has enabled the millers to apply their technical skill in such a way that 85 per cent. flour diluted with other cereals and containing *creta* and milk powder will, with proper treatment in the bakery, yield attractive and palatable bread which shows the minimum deterioration compared with established peacetime standards. It is to be hoped, however, that it will not be necessary to raise the degree of dilution, since the inclusion in flour of an appreciably greater proportion of cereal diluents, particularly if the increase coincided with the enforced employment of a higher proportion of native wheat in the grist, would lead to an unavoidably significant loss of quality in the bread.

Cvinaya Tushonka

THREE million pounds of Cvinaya Tushonka, a special type pork product, which is as important to the Russian soldier as ham and eggs to the American doughboy, has been purchased by the U.S.A. Food Administration, states *Butcher's Advocate*, Chicago, U.S.A.

Tushonka, as it is familiarly known in the Red Army, is a special type of pork product, highly spiced and made of boneless cuts of lean meat. It is prepared almost exclusively for the soldier who is remote from his supply base and must have a quick "pick-up" of protein food to keep him in proper battle condition.

The fact that the product is precooked and comes in a handy can means that the fighting man on the front line can eat it cold or hot as conditions permit. Nor does he have to rely on his mess officer for an appetising batch of meat. No special cooking equipment is needed since Tushonka can be heated in its original can.

Each can contains almost a pound of Tushonka. The lean, boneless pork is packed 2 to 4 pieces per can. Seasoning includes onions, salt, pepper, and at least one whole bay leaf or its equivalent. In addition the can contains a substantial amount of lard or rendered fat from the pre-cooking operation, or a combination of such pork fats. The product is packed for overseas shipment in special solid-fibre containers suitable for the long journey under difficult conditions.

This novel product, never before sent to Russia, is one of many new foods being delivered by the Food Distribution Administration for shipment to the United Nations and processed in exact accordance with the special needs of our Allies.

Food Production by Micro-organisms

Part I

PROTEIN PRODUCTION

The biochemistry of micro-organisms has been studied mainly from the viewpoint of their catabolic activities—*i.e.*, their power to break down naturally occurring complex substances, polysaccharides, fats and proteins, into their respective cleavage products. This is probably due to two main causes : the necessity to control spoilage of foodstuffs by these activities and their employment to produce particular end-products of industrial or medicinal use. However, during the course of micro-biological investigations, a good deal of information has accumulated regarding the synthetic activities of micro-organisms. Some of these have remained at the laboratory stage, but others have been turned to large-scale production. The purpose of this series of articles is to indicate some of the main conclusions regarding the synthesis of proteins, fats and vitamins by micro-organisms, and to supply the literature references where more detailed information may be found.

H. T. FAWNS, M.Sc., F.I.C.

FOR PURPOSES of convenience, micro-organisms will be considered under three headings : (*a*) yeasts. (*b*) fungi (" moulds ") and (*c*) bacteria.

Protein Production by Yeasts

The product may be either for human consumption (meat substitute) or fodder yeast for farmstock. Of the various types of organisms investigated, yeasts appear pre-eminent for protein production. The substrate is cheap and readily available in bulk, glucose, either as molasses or obtained from wood by acid hydrolysis, using the Bergius or Scholler-Tornesch process, forming the source of carbon. Ammonium salts can form the sole source of nitrogen and are obtainable from atmospheric N by the Haber process. The yield is high and the process rapid.

Thus, Prescott and Dunn[1] quote yields of 25 kg. or more of dried yeast from 50 kg. of wood sugar, representing 100 kg. of dry wood substance. Since yeast contains rather more than 50 per cent. protein (dry weight), this represents a conversion of approximately 12 to 15 per cent. of dry wood to protein.

Chryzaszcz and Janiki[2] quote experiments with *torula utilis*, or " mineral yeast ", where 100 parts of wood sugar gave 40 per cent. of dry yeast for fodder purposes, equivalent to, say, approximately 20 per cent. protein. The *torula utilis* could be used for starting forty-five runs with good results. Two sources of nitrogen were tried : (*a*) ammonium salts ; (*b*) malt germ : the transformation of N into yeast protein being 98·3 per cent. and 1·7 per cent. respectively, which shows the preference of this strain for ammonium salts.

Ramsbottom[3] states that *torula utilis*, grown on dilute molasses with superphosphate, magnesium and ammonium salts, and aerated, produced 130 gm. of yeast (dry ?) from 100 gm. of molasses in eight hours. The product was suitable for human consumption and used by the Germans during the last war to supplement the bread ration, their yeast-drying plant producing some 20,000 tons of dried yeast annually.

Pavcek, Peterson and Elvehjem[4, 5] studied the yields and vitamin B_1 contents of various yeasts grown on three types of media. Their media are shown in Table 1 and their yields for various types of yeast in Table 2.

Preparation of the Medium

This was sterilised in 5-gallon Pyrex bottles by auto-

TABLE 1.

COMPOSITION OF SOME MEDIA FOR THE GROWTH OF YEAST.

Grain-wort Medium.		*Molasses-salts.*		*Glucose-salts.*	
Corn	2·0 kg.	Beet molasses (crude)...	150 gm.	Glucose (commercial)	70 gm.
Malt	1·5 kg.	Ca phosphate	1 gm.	NaCl	2 gm.
Sprouts	1·5 kg.	$(NH_4)HPO_4$	1 gm.	$MgSO_4$	2 gm.
Conc. HCl	10 c.c.	Urea	2 gm.	$CaCl_2$	0·4 gm.
Tap water to	30 litres	Conc. H_2SO_4	2 c.c.	K pyrophosphate ...	2 gm.
		Tap water to	1,000 c.c.	Ferric pyrophosphate	0·1 gm.
				NH_4Cl	0·15 gm.
				$CuSO_4$	trace
				Urea (commercial)...	2·4 gm.
				Tap water to ...	1,000 c.c.

claving at 15 lb. pressure from 45 to 60 minutes. The *p*H was adjusted to 4·4. These authors describe (with diagram) an apparatus for growing yeast in batches of from 1 to 4 kg. One hundred litres of liquid medium can be handled at a time under conditions of controlled temperature and aeration (see also Prescott and Dunn[1]). It should prove useful for carrying out pilot trials with new species, or fresh types of media.

Two hundred gm. of fresh stock yeast gave the best results, while a temperature of 30° C. was found to give the best results.

The necessary *p*H is generally accepted as 4·0-4·3, and the authors' results tend to confirm this. Taxner[6] states that the initial *p*H should be 3·4-3·9, but on grain-wort medium Kautzmann[7] considers that the yield is independent of *p*H within the range 3·5-6·5. Pavcek *et al.*[4, 5] found that the yield was lower when the *p*H was maintained at 6·2.

As regards the carbon/nitrogen ratio, 16 : 1 proved satisfactory; 25 : 1 was too low, and the N-content of the medium then became the limiting factor.

Since the addition of 3 per cent. grain-wort produced no significant acceleration of growth, they assumed that sufficient " Bios " was present in the inoculum, although previously Nielsen[8], in small-scale tests, improved the yield by adding 1 per cent. of wort to the medium.

The fermentation time was from 70 to 80 hours for most experiments. The addition of 1,800 I.U. of vitamin B_1 produced no significant increase in the yield.

TABLE 2.

Yields of Dry Yeast from Various Media.

Type of Yeast.	*Grain Medium. per cent.*	*Molasses-salts. per cent.*	*Glucose-salts. per cent.*
Baker's yeast (A) ...	24·3	34·6	18·0
Baker's yeast (B) ...	42·5	33·6	34·3
Brewer's yeast (A) ...	34·6	42·7	20·0
Saccaromyces logos ...	33·1	28·0	21·4
Willia anomala ...	21·4	28·6	11·4
Endomyces vernalis ...	40·0	33·6	30·5

Note.—*The percentage of dry yeast is based on glucose fermented.*

The yields varied both with the yeast species and the medium. Grain-wort and molasses-salts appeared about equally efficient, glucose-salts somewhat inferior.

Growth Rate

Frey, Kirby and Schultz[9] state that at 30° C., under optimum conditions, a yeast should double its weight in slightly less than two hours. Under conditions of unrestricted growth, the yield increases logarithmically with time. This can be expressed by the equation :

$$\frac{dx}{dt} = K(a-x), \text{ or integrated, } 0.4343Kt = \log(a+x) - \log a,$$

where $(a+x)$ is the yield of yeast in time t from an amount of seed a, 0.4343K is the " propagation constant ", and may be considered as specific for an individual strain of yeast under a definite set of conditions.

Slator[10] points out that yeast growth occurs in three phases, (1) an initial " lag phase "—during which budding occurs, (2) a period of unrestricted growth—logarithmic phase, (3) a period of declining growth rate—due either to the exhaustion of some essential constituent in the medium or to the accumulation of toxic reaction products.

Effect of Oxygen

Since the early work of Pasteur, it has been recognised that growth and alcoholic fermentation are not necessarily one mechanism. Anaerobic conditions favour alcoholic fermentation but aeration favours optimum growth. Consequently, from the point of view of protein production, aeration is essential.

Slator[10] found oxygen supply to be non-essential during the " lag phase ". He considers that its subsequent importance may be largely due to the resultant removal of carbon dioxide from the fermentation mixture, the accumulation of which in the fermentation liquid has an inhibiting effect on growth. This is understandable from the Law of Mass Action. Since the energy for synthetic processes is derived from the oxidation of glucose or other carbon compounds to CO_2 and H_2O, the removal by aeration of CO_2 from the reaction system would set up conditions favouring the oxidation of more substrate, and *vice versa*.

The relationship between respiration and fermentation has been extensively studied by Meyerhof and others.[11]

Disregarding the intermediate compounds formed (Hexose mono- and di-phosphate, etc.), and considering only the end-products of the reaction, there are two possible paths for the oxidation of sugar by yeast :

$$(1)\ C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O.$$

$$(2)\ C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$$

$$\downarrow\ / + 6O_2$$

$$4CO_2 + 6H_2O.$$

Frey *et al.*[9] point out that it is debatable whether, under aerobic conditions, the yeast obtains its energy for synthesis from scheme (1) or (2)—*i.e.*, whether no alcohol is formed (1), or whether it occurs as an intermediate compound and is subsequently oxidised (2). They point out that Meyerhof has shown that alcohol and other intermediate breakdown products of sugar can be oxidised by the cell when added to yeast suspension. If HCN(0·001-0·002 N) is added, no oxidation of the alcohol occurs and the second step in scheme (2) is inhibited.

Lundsgaard[12] showed that iodo-acetic acid (0·001 N) will inhibit the production of alcohol—*i.e.*, completely block (2)—and yet oxygen is consumed by the yeast. This suggests that there is a separate route for the oxidation of sugar, covered by scheme (1), and that respiration and fermentation do not necessarily follow a common pathway.

Frey *et al.*[9] have found that the addition of certain substances—*e.g.*, ethylene chlorohydrin—to yeast suspensions destroys its ability to form alcohol without decreasing the yield of yeast—a point of technical importance. Stich[13] has shown that the amount of aeration necessary for maximum yields may be greatly decreased if the air is introduced as extremely fine bubbles.

While it is generally agreed that aeration stimulates

the vegetative processes of yeast, the mechanism is still incompletely understood. For a review of the intermediate compounds formed during the degradation of glucose by yeast, see Stephenson.[14]

Substrates for Yeast

Whereas sugar is the normal source of carbon, Prescott and Dunn[1] point out that lactic acid, amino acids, or even alcohol may be used under certain conditions, while nitrogen supply, apart from malt, mashed cereal or NH_4-salts, can also be given in the form of peptones, peptides or amino-acids (also urea). Nitrates and nitrites are not assimilated.

From the above it can be seen that ammonium lactate would serve both as a source of carbon *and* nitrogen.

Lactic acid is produced commercially from whey and other dairy by-products by fermentation of the lactose with cultures of *Strep. lactis, L. bulgaricus*, etc., added as "starters". The reaction proceeds to completion by maintaining the *p*H between 5·0 and 5·9 by adding lime [$Ca(OH)_2$] to neutralise excess acid. The resultant calcium lactate is split by H_2SO_4, the $CaSO_4$ filtered off, and the lactic acid recovered. If ammonia were used in place of lime to neutralise the acid, the resultant ammonium lactate should support the growth of *torula utilis* or similar yeast and the lactose thus be converted to protein. This would open the possibility of producing protein from dairy by-products and milk effluents.

Nutritive Value of Yeast Protein

Yeast contains from 68 to 83 per cent. moisture, and thus 17 to 32 per cent. of total solids. Prescott and Dunn[1] quote values given by Frey for a typical analysis of yeast (Table 3). The proteins of yeast include albumen, globulin, phosphoprotein, nucleoprotein, lecithoprotein and glycoprotein, together with the usual soluble protein cleavage-products.

Hutchinson and Mottram[15] give the following analysis of a yeast extract (Table 4).

In *The Science of Nutrition* (1928 edn.), Graham-Lusk gives the biological value of yeast protein as 71 (*cf.* beef protein 104, milk protein 100). He places it ninth on a list of fifteen proteins whose biological value ranged from 104 down to 30.

Mitchell[16], in rat experiments, where protein constituted only 5 per cent. of the ration, obtained a biological value of 85 for yeast (*cf.* milk 93).

TABLE 3.

COMPOSITION OF THE DRY MATTER OF YEAST.

	per cent.		*per cent.*
		Ammonia	8·0
		Purine and pyrimidine bases ...	12·0
Protein	52·41	Diamino acids ...	20·0
Fat	1·72	Monoamino acids ...	60·0
Glycogen	30·25	Phosphorus pentoxide	54·5
Cellulose, gum, etc.	6·88	Potassium oxide ...	36·5
Ash	8·74	Magnesium oxide ...	5·2
		Calcium oxide ...	1·4
	100·00	Silicon oxide ...	1·2
		Sodium oxide ...	0·7
		Sulphur trioxide ...	0·5
		Chlorine and iron ...	trace

TABLE 4.

ANALYSIS OF A YEAST EXTRACT.

	per cent.
Water	26·84
Nitrogenous extractives	34·67
Protein	10·50
Mineral matter	26·95

With sulphite yeast, Richter and Ehinger[17] showed that in digestibility trials with pigs and sheep, 78·5 and 85·3 per cent. respectively of yeast protein was assimilated.

Fink *et al.*[18] treated steamed potatoes with malt to convert the starch to sugar and then seeded with *torula utilis*. The resultant *Eweissschlempe*, when dried, contained 37 to 43 per cent. of crude protein.

Bunger *et al.*[19] compared fish meal with xylose-yeast (wood-sugar yeast—30 per cent. digestible protein) as sources of protein in feeding trials with pigs. The average live-weight gain was lower with yeast in the initial stages, but the difference became very small in later stages.

Analysis of Yeast Protein

Yeast protein is generally considered to be biologically complete—*i.e.*, it contains all the essential amino acids.

An analysis of yeast protein by Van Slyke's method has been carried out by Kraut and Schlottman[20] using three samples of a dried yeast intended for human con-

TABLE 5.

ANALYSIS OF YEAST PROTEIN.

(After Kraut and Schlottman.[20])

Fraction.	*Average of Three Samples.*	*Meisenheimer's Values.*	*Schröder's Values.*	*Most Probable Value.*
Total N	*100*	*100*	*100*	*100*
Humin-N	3·1	—	—	—
Ammonia-N	16·0	10·0	6·6	—
Arginine-N	11·3	10·0	3·5	11·0
Histidine-N	4·1	3·0	2·0	3·0
Lysine-N	11·4	10·0	11·0	11·0
Cystine-N	1·6	*c.* 0·2	?	1·6
Tryptophane-N	0·9	0·6	—	0·9
Tyrosine-N	2·5	*c.* 0·2	—	2·5

sumption (product of Gloria-Nahrhefe G.m.b.H.). Their results are compared with earlier analyses by Schröder (1902) and Meisenheimer (1919), from which an average value is deduced (see Table 5).

In a further table, the authors compare their analyses of yeast protein with those of meat, casein, lactalbumen, rye and potatoes. Compared with meat, yeast protein is low in tryptophane. It is superior to cereal protein in its content of arginine, lysine, cystine and tyrosine. It is particularly rich in cystine. From a nutritional point of view they conclude that it occupies a middle position between plant and cereal proteins, but that its high cystine and lysine content should make it a valuable supplement to a vegetable diet.

Protein Production by Moulds

While moulds have been used on a large scale for the conversion of carbohydrate to fats, their employment for protein production has received less attention. This is probaby due to their inferiority in this respect compared with yeasts, especially mineral yeast such as *torula utilis*.

Furthermore, the percentage of total solids is lower in moulds than in yeasts, and the same applies to their nitrogen content, as the following figures compiled from Buchanan and Fulmer[21] show (Table 6).

TABLE 6.

TOTAL SOLIDS AND NITROGEN IN YEASTS AND MOULDS.

	Water Content.	*Total Solids.*	*Total N (dry weight).*
	per cent.	*per cent.*	*per cent.*
Yeasts ...	68·0-83·0	32·0-17·0	4·63-15·0
Moulds ...	84·3-88·7	15·7-11·3	2·26- 8·26

The nitrogen values represent ten analyses of yeasts and six of moulds. The superiority of yeasts over moulds, as regards protein production, is obvious from the above table. However, many moulds will attack fibrous material such as straw, etc., being capable of breaking down celluloses and hemicelluloses, and their employment to produce protein from substrates containing these substances offers possibilities.

Thus, Ramsbottom[3] quotes work by Pringsheim and Lichtenstein carried out in Germany during the last war. A non-pathogenic strain of *Aspergillus fumigatus* was grown on straw impregnated with ammonium salts as the source of nitrogen. As a result, the protein content of the mixture was increased from 1 to 8 per cent. When fed experimentally to sheep 40 per cent. digestibility was obtained.

Raistrick and his school of workers[22] report the isolation of an alkali-soluble protein, resembling leaf protein in composition, from *Penicillium chrysogenum*, when grown on glucose, with sodium nitrate as the sole source of nitrogen. From the same laboratory, Clutterbuck[23] mentions the isolation of a glucosamine-containing protein from *Aspergillus fischeri*.

Protein Synthesis by Bacteria

This has been studied mostly from the viewpoint of immuno-chemistry, or, in the case of soil organisms, of increasing the organic nitrogen in the soil. Their use as a possible source of commercial protein appears to have received little attention. The reasons would appear to be these :

(1) All pathogenic organisms are ruled out at once for obvious reasons.

(2) Organisms which give rise to indole, skatole, butyric acids, etc., would render any product unfit for consumption.

(3) As in the case of moulds, the moisture content of bacteria is higher than yeasts, ranging from 73·3 to 98·3 per cent. (Buchanan and Fulmer[21]), and total solids are thus lower—viz., 26·7 to 1·7 per cent.

(4) The species most likely to be of use are largely soil- or water-borne organisms, and these convert their substrates much more slowly than yeasts or moulds. Incubation periods of several weeks are sometimes necessary before appreciable conversion occurs, compared with a matter of hours in the case of, say, *torula utilis*. Some means of accelerating their fermentation rate would be necessary to make them practicable, even if their products proved edible.

Nevertheless, some of the synthetic activities of bacteria are remarkable, and the following groups of organisms suggest possibilities which might be turned to account under certain conditions.

Autotrophic Bacteria

Autotrophic bacteria synthesise organic compounds from *entirely inorganic sources*. Carbonate, generally supplied as calcium carbonate, forms the usual source of carbon, while ammonium salts, nitrate or nitrite act as a source of nitrogen. They frequently derive their energy for synthetic purposes by carrying out some independent reaction, such as the oxidation of iron, sulphur, thiosulphate, or even methane and hydrogen.

Table 7 gives a list of some of this group with their reactions. For further details, see Stephenson[14].

TABLE 7.

AUTOTROPHIC BACTERIA.

Organism.	*Oxidative Reaction.*
Nitrosomonas	$NH_3 + 3O = HNO_2 + H_2O$.
Nitrobacter	$HNO_2 + O = NHO_3$.
Beggiatoa	$H_2S + \frac{1}{2}O_2 = H_2O + S$ and $S + 1\frac{1}{2}O_2 + H_2O = H_2SO_4$.
Thiobacillus thioparus...	$5Na_2S_2O_3 + H_2O + 4O_2 = 5Na_2SO_4 + H_2SO_4 + 4S$.
Thiobacillus thio-oxidans	$S + 1\frac{1}{2}O_2 + H_2O = H_2SO_4$ and $Na_2S_2O_3 + 2O_2 + H_2O = Na_2SO_4 + H_2SO_4$.
Leptothrix ochracea ...	$4FeCO_3 + O_2 + 6H_2O = 4Fe(OH)_3 + 4CO_2$.
B. pantotrophus ...	$H_2 + \frac{1}{2}O_2 = H_2O$.
B. methanicus	$CH_4 + 2O_2 = CO_2 + 2H_2O$.

Nitrogen Fixing Bacteria

These are divided into two classes : (*a*) Symbiotic organisms—*Rhizobium*—which fix atmospheric nitrogen *only* when growing in the nodules of *leguminosæ*; (*b*) non-symbiotic organisms—*Azotobacter* group and *Clostridium butricium* (syn. *pasteurianum*)—which fix atmospheric nitrogen independently of any host. *Azotobacter* are aerobic, the *Clostridium* anaerobic. Protein formation in group (*b*) has been fairly extensively

studied, since they can be grown in pure culture in a nitrogen-free medium.

Thus, Green[24] grew four strains of *Azotobacter* on N-free mannitol and analysed the bacterial growth. The protein contents (dry weight) were as follows: Group A: *Az. agilis*—61·19 per cent., *Az. vinelandii*—56·25 per cent.; Group B: *Ad. beijerinki*—24·68 per cent., *Az. chrococcum*—25·00 per cent. Besides having the higher protein content, Group A also had a greater nitrogen-fixing power. The proteins present were mostly globulins, glutelins and albumens. Analyses of protein composition were carried out by a modification of Van Slyke's method and are recorded.

Protein formation is greater in liquid than on solid media, where capsule formation accounts for a good deal of the bacterial mass collected. Not all the nitrogen fixed is retained as protein. Up to 50 per cent. can be liberated in an extra-cellular soluble form, according to Horner and Burk[25]. The amount of nitrogen fixed (in mgm.) per gm. of substrate consumed is given by Waksman[26] for a number of substrates. Some of these values are quoted in Table 8, where an attempt has also been made to give the protein (N ×6·25) as a percentage of substrate consumed, assuming 50 per cent. of the nitrogen occurred in this form and 50 per cent. was excreted, according to Horner and Burk's conclusions.

TABLE 8.

NITROGEN FIXATION BY AZOTOBACTER.

Substrate (1 *gm.*).	*Lactose.*	*Glucose.*	*Starch.*	*Calcium Lactate.*
N fixed (mgms.)...	9·12	4·62	3·36	2·49
Protein as per cent. of substrate used (50 per cent. of N ×6·25) ...	2·85	1·44	1·05	0·78

Virtanen[27] states that under optimum conditions *Azotobacter* will fix 30 mgm. of N per gm. of carbon consumed. Assuming 50 per cent. N retention, this represents 0·0938 gm. of protein per gm. of carbon, or a conversion of 9·39 per cent. Compared with the protein yields from yeasts, these values are low.

Azotobacter fix more nitrogen when growing symbiotically with other organisms than in pure culture. Nitrogen fixation only occurs within the *p*H range 8·3 to 5·9, with an optimum at about 7·5. Aerobic conditions favour N-fixation. Further, they will not fix atmospheric N readily in the presence of pre-formed nitrogen compounds, but tend to live on the latter till they are exhausted.

For example, using a mixture of 50 per cent. *unsterilised* whey and 50 per cent. water inoculated with *Az. chrococcum*, the author has obtained an increase in the N-content of 7·2 per cent. in 28 days and 30·7 per cent. in 42 days, compared with an uninoculated control. No fixation occurred at all for the first 14 days, by which time all the lactose had been consumed. The best result corresponded with a fixation of 16·8 mgm. N per gm. of lactose consumed. (Initial lactose content, 1·84 per cent.) The *p*H was adjusted by small additions of $Ca(OH)_2$. Cultures were kept at room temperature *and aerated*. But *without aeration*, *Az. agilis* and *Az. vinelandii*, two much more potent N-fixers, only increased the N-content by 7·4 per cent. and 6·4 per cent. respectively in 21 days, despite their being incubated at optimum temperature—25° to 28° C.—and the substitution in the whey medium of phosphate buffer at *p*H 7·7 for water. In 100 per cent. whey the initial N-content was evidently sufficient to support growth without fixation, since no increase was observed after 42 days either with or without aeration.

In cultural experiments most workers seem to have resorted to incubation periods of from 7 to 28 days in order to observe appreciable N-fixation. In general, although *Azotobacter* are of value in raising the amount of organic nitrogen in soils, and commercial cultures have been prepared for this purpose (see Waksman[26]), their use as a direct source of commercial protein appears dubious unless cultural methods could be devised which would accelerate greatly their speed of reaction.

Cellulose Fermenting Bacteria

Many bacteria, both aerobic and anaerobic, will attack cellulose. Ammonium sulphate forms the main source of nitrogen, but in some cases 1 per cent. yeast extract is necessary. In the soil some cellulose decomposing organisms appear to live symbiotically with *Azotobacter*. The latter cannot utilise raw cellulose; but the former hydrolyse it to glucose and organic acids—formic, acetic, etc.—and *Azotobacter* assimilates these cleavage products. Conversely, the cellulose decomposers utilise the nitrogen fixed from the atmosphere by *Azotobacter*.

Recently, Jensen and Swaby[28] have been able to reproduce these conditions *in vitro*, using either *Corynebacterium* or a species of *Cellulomonas* in combination with *Azotobacter*. Filter paper, grass or straw could be utilised with approximately the same efficiency, and achieved a fixation of 6 to 14 mgm. N per gm. of cellulose decomposed. Mixed cultures of *Cellvibrio*, *Azotobacter* and *Cl. butyricum* (*pasteurianum*) would fix 12 mgm. N per gm. of cellulose. In these experiments ammonium sulphate served as the initial source of nitrogen for the cellulose fermenters, with the addition in some cases of small amounts of yeast extract or peptone.

In these experiments also, the long incubation time does not favour the adoption of this type of fermentation on a technical scale, but here, too, the possibility remains that under special cultural conditions the fermentation time could be decreased and the yield improved.

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(*Continued on page 200*)

Food Manufacturing Equipment

Its Depreciation and Management (Part II)

S. HOWARD WITHEY, F.C.I.

IMPROVEMENTS in design and operating refinements often compel the food manufacturer to replace certain units of equipment by more modern plant, and in all such cases adjustments have to be made in the records. As compared with machines used a few years ago, and which needed constant personal attention, the latest refrigerating compressors are not only silent and free from vibration, for example, but are thoroughly reliable and highly efficient.

A recent example of the retirement of old equipment and the acquisition of new may be cited to indicate the nature of the adjustments which have to be made. At the end of March last the machines employed by a firm of food manufacturers in the Midlands for the conservation of certain perishable foodstuffs had a book value of £315, which amount was included on the assets side of the firm's balance-sheet. In April, 1942, a number of compressors were installed, at a total cost of £750, to ensure the greatest possible refrigerating effect at a lower cost for power and labour, and it was decided to write off the book value of the old machines and to capitalise the new expenditure. The asset account in the firm's private ledger was consequently adjusted as follows:

COMPRESSORS ACCOUNT

Debit.	£		*Credit.*	£
1942. Mar. 31. To Balance	315	1942. Apr. 30. By Amount written off		315
	£315			£315
1942. Apr. 30. To Capital outlay	750			

The book value of the entire refrigerating plant employed by this firm as at March 31 last was £3,000, and as it was anticipated that this plant would continue to be simple to operate, and that the cost of upkeep would not vary materially, it was proposed to spread the capital value over the next ten years, on the assumption that the value of the plant at the end of that time will be something like £1,000. The sum to be allocated against profits during the period of service life was ascertained by deducting the estimated value ten years hence from the current book value, giving £2,000, or £200 per annum. In April, 1942, additional refrigerating plant was installed to meet an urgent national need, at a total cost of £1,200, including transport charges and certain expenses, these additions being estimated to last twenty years. Each year's profits will therefore be debited with another £60 for depreciation, and the annual computations were made in the manner indicated below:

	£
One-tenth of £2,000 (viz., book value as at March 31, 1942, £3,000, *less* value 10 years hence £1,000)	200
One-twentieth of £1,200 (viz., an equal proportion of the original capital cost of additional plant)	60
Depreciation	£260

At the end of ten years the plant account will appear as below:

REFRIGERATING PLANT ACCOUNT

Debit.	£		*Credit.*	£
1942. Mar. 31. To Balance	3,000	1943. Mar. 31. By Depreciation written off		260
Apr. 30. ,, Additions	1,200	,, ,, ,, Balance		3,940
	£4,200			£4,200
1943 Apr. 1. To Balance	3,940	1944. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		3,680
	£3,940			£3,940
1944. Apr. 1. To Balance	3,680	1945. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		3,420
	£3,680			£3,680
1945. Apr. 1. To Balance	3,420	1946. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		3,160
	£3,420			£3,420
1946. Apr. 1. To Balance	3,160	1947. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		2,900
	£3,160			£3,160
1947. Apr. 1. To Balance	2,900	1948. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		2,640
	£2,900			£2,900
1948. Apr. 1. To Balance	2,640	1949. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		2,380
	£2,640			£2,640
1949. Apr. 1. To Balance	2,380	1950. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		2,120
	£2,380			£2,380
1950. Apr. 1. To Balance	2,120	1951. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		1,860
	£2,120			£2,120
1951. Apr. 1. To Balance	1,860	1952. Mar. 31. By Depreciation written off		260
		,, ,, ,, Balance		1,600
	£1,860			£1,860
1952. Apr. 1. To Balance	1,600			

The final balance of £1,600 would comprise £1,000 as the value of the old machines, and £600 as the book value of the recent additions.

Sometimes the sum written off against the periodical profits is deducted from the opening book value when drafting the balance-sheet, the cost of any additions during the period being then added for inclusion in the assets total. If, however, the additions have been subjected to deduction during the period under review, it is better to add the capital cost of such additions to the opening book value before deducting depreciation written off.

Computation of Depreciation

As a rule the highest value that can be placed on food manufacturing equipment is the first or original capital cost of acquiring the units or layout, plus transport charges, installation and foundation expenses. The lowest value will consist of the value of the material and parts, including cylinders, pumps, tanks, conveyors, etc., less the cost of dismantling and any carriage or selling expenses. In practice, therefore, the computation of depreciation for inclusion in manufacturing costs is frequently based upon the difference between these two extreme figures, the charge being spread over the period of service or useful life, with due regard, of course, to the conditions under which the particular equipment is to be operated. It may be advisable to run some installations for a reasonable time before finally deciding the method of computation to be applied, and, while it is true that the productive assets employed by the manufacturer established in a small way of business can often be determined on general lines, in the case of the large food manufacturing concern much more scientific methods are demanded, especially as the tendency is in the direction of the classification of equipment for separate treatment. When units of machinery are installed for the purpose of satisfying a specific demand—whether national, local, seasonal or temporary—the fixed charges applicable to such machines need not be allocated over the entire layout, and may more correctly be debited against specific jobs and contracts.

Dairy and Ice Cream Equipment Association

The fifth annual meeting of the Dairy and Ice Cream Equipment Association was held in London on April 28, with the president, Mr. E. A. Shepheard, in the chair.

The new officers elected were as follows:

President: Graham Enock.

Secretary and Treasurer: H. B. Cronshaw.

Committee: R. Arnison, A. Askey, Frank J. Clarke, A. F. Gear, L. J. Hydleman, P. K. MacKenzie, J. S. Clayton Marshall, J. E. Randall, C. A. Wyatt, R. Harold Morgan, H. A. H. Crowther, J. Matthews, H. W. Wadsworth, Arthur G. Enock.

The honorary auditors, C. G. Boxall and P. K. MacKenzie, were re-elected.

The preliminary business having been concluded, the report of the sub-committee appointed to explore the possibilities of an all-embracing trade association of dairy engineering firms was received.

Government control of labour and materials has made it obvious that, in common with all sections of engineering, the dairy equipment industry must have representation befitting the importance of the dairy industry itself. This necessitates the formation of a trade association comprised of those firms manufacturing and supplying dairy plant and machinery to the home and export markets. The task of the sub-committee fell into two main headings:

(*a*) To consider the expansion of the present Dairy Equipment Export Group to include an industrial section.

(*b*) To form a new Trade Association to include all firms who manufactured and sold dairy equipment in this country for use at home and abroad, with the recommendation that the new association contain an export section, which would in fact be the present Dairy Equipment Section of the existing Food Machinery and Chemical Plant Industrial Export Group.

The sub-committee's recommendations covered a wide field and were summarised as follows:

(*a*) That a Trade Association of Dairy Engineers be formed.

(*b*) That the D.I.C.E. Association authorise the convention of an inaugural meeting of firms interested in the trade, to which the following resolution be submitted: "That the Association of Dairy Engineers be and is hereby formed."

(*c*) That the methods of administration of the proposed Association of Dairy Engineers be so arranged that the maximum advantage can be taken of the centralised direction afforded by the membership of the Food Machinery and Chemical Plant Industrial Export Group.

It was considered that the Association should be confined to dairy engineers.

The report was approved and the date of the inaugural meeting was fixed for June 8.

Food Production by Micro-organisms

(*Continued from page* 198)

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News from the Industry

APPOINTMENTS

Mr. A. R. W. Harrison

Mr. A. R. W. Harrison, private secretary to the Minister of Food, has been appointed Deputy Director of Public Relations to the Ministry.

The Minister has appointed Mr. H. R. Metcalf and Mr. G. H. C. Amos to be his private secretaries.

* * *

Mr. N. G. Loughnane

Mr. N. G. Loughnane, C.B., has been appointed as a member of the British Food Mission in North America to take charge of the Mission's office at Ottawa in succession to Mr. G. H. S. Pinsent, C.M.G., who, at the request of the Treasury, is being released from service with the Ministry to take up other duties.

* * *

Dr. Charles S. Hanes

The Lord President of the Council has appointed Mr. Charles S. Hanes, Ph.D., F.R.S., to be Director of Food Investigation in the Department of Scientific and Industrial Research.

Dr. Hanes is at present serving with the Food Mission in North America, his services having been made available by the Department of Scientific and Industrial Research to the Ministry of Food for this purpose. The date from which he will take up his new post has not yet been fixed.

* * *

Chocolate and Confectionery Prices

As a result of the use of more expensive ingredients in certain chocolate and sugar confectionery, small increases in price to the public may be necessary. Orders have, therefore, been made by the Minister of Food adding certain intermediate product groups to the schedules to the Maximum Prices Orders for sugar confectionery and chocolate and chocolate confectionery so as to enable certain prices to be adjusted to the nearest ½d. per ¼ lb.

Mr. E. F. Farrow

Mr. E. F. Farrow, Director of Cold Storage at the Ministry of Food since January, 1940, has resigned for reasons of health, but will assist the Ministry as adviser. Mr. H. R. Howells, the deputy-director, will succeed Mr. Farrow, and Mr. J. N. Walker, manager for the Union Cold Storage Company in Scotland for many years, has been appointed deputy-director.

* * *

Collection of Fat Containers

The Ministry of Food reminds traders of the urgent necessity to save, for repacking purposes, all wood and fibreboard margarine, compound cooking fat and lard containers.

Supplies of new packing material have been reduced. Returned empty wood and fibreboard cases must be used in order to maintain distribution of essential rationed commodities, so that it is essential that the containers are available for use again by the factories.

* * *

Caramel for Bakers

The Ministry of Food informs bakers who use caramel (sometimes known as "black jack") that a reduction is being made in the materials allocated for its manufacture. Makers of caramel have been instructed that the quantity of caramel supplied to bakers should not, until further notice, exceed 40 per cent. of their purchases during the year ended June 30, 1939, unless specially authorised by the Sugar Division.

* * *

Oil Prices

The Ministry of Food's selling prices for certain oils to primary wholesalers and large trade users have been raised as follows: Linseed oil from £46 10s. to £50 per ton. Rapeseed oil from £54 to £58 per ton. Castor oil, firsts from £72 to £92, and seconds from £70 to £90 per ton. These changes took effect from May 8.

Control of Soya Beans

The Minister of Food has made an Order controlling soya beans. This Order prohibits the use of soya beans except for human food or in the manufacture of human food. It also stipulates that any person wishing to buy or sell soya beans, otherwise than by retail, must first obtain a licence from the Ministry of Food.

The Order came into force on April 11, 1943, and will be known as the Soya Beans (Control) Order, 1943.

* * *

Control of Cereal Fillers

The Minister of Food has made an Order which removes from the provisions of the Cereal Fillers (Control and Maximum Prices) Order (S.R. & O. 1943, No. 345) foods licensed or authorised under the following Orders:

The Manufactured and Prepacked Foods Order;
The Food Substitutes Order;
The Soya Flour (Control and Maximum Prices) Order.

* * *

Agriculturists' Visit to U.S.A. and Canada

The Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Ministry of Information have asked a party of four agriculturists with practical experience of the food production campaign to visit the United States and Canada in the near future.

The party will consist of Mr. T. R. Ferris, O.B.E., Executive Officer of the Dorset War Agricultural Executive Committee, Mr. Watson Jones, vice-chairman of the Shropshire War Agricultural Executive Committee, Mr. T. B. Manson, Divisional Land Officer of the Department of Agriculture for Scotland, and Mr. A. G. Street, farmer and author. They will tour the United States and Canada, giving lectures on the British farmers' war effort. The visit is expected to last for two to three months.

Fuel Efficiency

The Ministry of Fuel and Power has recently issued for the Fuel Efficiency Committee the following new bulletins:

Bulletin No. 12: "Thermal Insulation of Buildings" (F.E.C. 121).

Bulletin No. 16: "Superheated Steam" (F.E.C. 142).

Copies of these bulletins have been sent to all large industrial fuel consumers throughout the country.

* * *

Canadian Sugar Beet

It is estimated that the 63,300 acres of sugar beet grown in Canada in 1942 produced 200 million lbs. of refined sugar, or about one-fifth of Canada's normal consumption. The objective for 1943 is at present considered to be the greatest amount of beet sugar that can be produced with present plant facilities.

* * *

Tomatoes: Distribution Scheme and Maximum Prices

The Minister of Food has made the Home-Grown Tomatoes (Control and Maximum Prices) Order, 1943, prescribing maximum prices and regulating the distribution of tomatoes in the 1943 season.

The principal changes in prices, as compared with 1942, are as follows: The grower's price during the period of maximum outdoor production, from September 16 to October 13, is reduced to 7d. per lb.; provision is made for two wholesale margins to operate throughout the country; the primary wholesale margin is reduced from 11d. to 6d.; and there are reductions in the retail margins and in retail prices.

Sales by growers to manufacturers will be permitted at a price of 7d. per lb. throughout the season.

In the North of England and in Scotland, growers' prices will throughout be a halfpenny a lb. more than in England, and because of this, and of transport costs, retail prices will be 1d. per lb. more.

The scheme of distribution will be substantially similar to that which operated in 1942, but in 1943 the whole scheme is given a statutory basis.

The Order provides for the continued operation of the Tomato (Primary Distributors) Association responsible, as in 1942, for the despatch of tomatoes from defined areas of concentrated production in the south of the country. The London Tomato Distributors' Association will continue to operate.

The principal change effected by the Order is that in place of voluntary Tomato Distribution Committees throughout the rest of the country there will be set up Tomato Distributing Associations. The Order provides that the constitution and the membership of a Tomato Distributing Association must be approved by or on behalf of the Minister.

Provision is made for representation within each association of growers and of the various categories of traders, wholesale and retail. For further details reference to the Order should be made.

* * *

Minimum Food Requirements

The following letter appeared in *The Times* for April 7:

It is a matter for satisfaction that Sir William Beveridge has, in his report, recognised the principle that quantitative standards based on scientific knowledge may, and should, be applied to the measurement of minimum human requirements in food, fuel, light, and clothing.

As medical knowledge advances and as cultural demands change, any standards of this nature will be gradually modified, though there can be no doubt that those for food have now been determined with a fair degree of scientific accuracy. We would express our conviction that the food standards now proposed for this country, based as they are on the scales laid down by the British Medical Association and the League of Nations Technical Commission, accord with the opinion of all accredited scientific workers in this particular field.

It is not our business to decide what shall be the actual scales of cash benefit and allowance under any system of social security. That decision rests with the people of this country and with their elected representatives. But we do urge that all such scales shall, in future, be related immediately to the scientifically estimated needs of each type of beneficiary.

(Signed) JOSEPH BARCROFT, S. DAVIDSON, F. GOWLAND HOPKINS, HORDER, JULIAN HUXLEY, J. M. MACKINTOSH, CHARLES MARTIN, R. McCARRISON, MORAN OF MANTON, B. S. ROWNTREE, J. C. SPENCE, W. H. WYNN.

Green Tea Leaves for Pilots

Green tea-leaves are eaten by Japanse pilots to alleviate fatigue at great altitudes, according to Dr. Umetaro Suzuki, of the Tokyo Physico-Chemical Research Institute. Dr. Suzuki, says the Japanese News Agency, declares that the leaves contain much vitamin C, which accelerates the aeration of the blood. They also contain vitamin B_2, which helps digestion, and vitamin B_1, which counteracts the effects of an excess of sugar in the system.—*Reuter.*

* * *

Wartime Association

Following discussions with the Government Departments interested, the corn and agricultural merchants are forming a wartime association to be known as "Camco" (the Corn and Agricultural Merchants Wartime Company). This company will be administered by a central board working through divisional committees. Meetings of traders are now being held in each county or groups of counties to elect members to the divisional committees.

It will be the function of these committees to co-operate in the arrangements for economy of transport and man-power so as to ensure that efficient services are still maintained.

* * *

New Process for Quick-Frozen Beef

"Instead of eight days, as formerly, beef can now be frozen in six hours. The patent of the new process is held jointly by the Smithfield and Argentine Co., and the Corporation of Argentine Meat Producers. It includes not only the quick-freezing process, but also a method of sucking the meat before freezing into moulds, which is said to reduce the required shipping space by 40 per cent. and to facilitate rapid freezing. Meat is sucked by a special vacuum process into moulds and then frozen in a brine-spray tank for six hours, after which it is loosened from the mould by a blast of steam and sent to the packing room for final preparation and shipment. The significant feature of this new method is the reduction in shipping space required for the frozen products."—*The Southern Planter.*

Coffee Merchants Association

The Coffee Importers and Exporters Association of London has been registered as a company limited by guarantee without share capital. The chairman is Mr. E. R. Greene, of E. Johnston and Co., and the vice-chairman Mr. F. J. Lydall, of Naumann, Gepp and Co.

* * *

Goodall, Backhouse and Co.

Goodall, Backhouse and Co. were granted in the Chancery Division recently an injunction to restrain a manufacturer, trading in Sheffield, from infringing plaintiffs' registered trade mark, "Yorkshire Relish", and from "passing off".

* * *

Liverpool Corn Trade Association

Mr. R. N. Cornelius was, for the second time, elected president of the association, and Mr. A. H. Shone is the new vice-president.

The new directors are: Messrs. E. A. G. Caröe, Wm. Hodson, E. Redmayne Jones, W. R. Nielson, H. S. Scott, and Cecil Vernon.

* * *

Sir Henry Hallett Dale

Sir Henry Hallett Dale, Kt., G.B.E., F.R.S., M.A., M.D., D.Sc., LL.D., F.R.C.P., has been awarded the Harben Gold Medal by the Executive Committee of the Council of the Royal Institute of Public Health and Hygiene.

This medal, which is international in character, was instituted in 1894 by virtue of a trust created by the late Sir Henry Harben, the then Master of the Worshipful Company of Carpenters, and is conferred every third year for "eminent services rendered to the Public Health".

The first Harben Gold Medal was awarded in 1895 to Professor Louis Pasteur, and the list of medallists contains the names of Lord Lister, Professor Robert Koch, Professor Elie Metchnikoff, Major-General William C. Gorgas, Sir Ronald Ross, Professor Sir Frederick Gowland Hopkins, and Sir Leonard Hill.

From Biscuits to Paper

Mr. W. Garfield Weston, the millionaire M.P., by his acquisition of the controlling interest in the E. B. Eddy Company, of Hull, Quebec, has entered a new sphere of industry. The Eddy Company manufactures pulp, paper and paper products.

Hitherto Mr. Weston's interests have been concerned mainly with biscuit making and in this he has been conspicuously successful. Today in this country his organisation controls a chain of bakeries and factories. He is chairman of Allied Bakeries and Weston Foods, having together an issued capital of upwards of four millions.

Mr. Weston also is head of the Weston organisation in the United States and Canada, owning mass-production factories for biscuit making and the like. In short, he controls the world's biggest multiple bakery business.—*Financial Times.*

* * *

Fredk. Boehm, Ltd.

Fredk. Boehm, Ltd., have recently opened a London office at 37-39, Lime Street, London, E.C. 3. Tel.: Mansion House 2383-4. The main articles handled are: essential oils, chlorophyll, lecithin, glycerine, and edible oils.

* * *

Ashwell and Nesbit, Ltd.

We have received three brochures concerned with automatic coal firing. They consist of well-illustrated descriptions of different systems of automatic firing of boilers and should be of interest to the engineering departments of food factories.

Cumming, Parsons, Limited

Cumming, Parsons, Limited, of Manchester, inform us that, owing to the continued ill-health of Mr. Cumming, he is taking up residence in Scotland, where he hopes to look after the firm's interests.

Mr. F. Farage, director and general manager, will continue his duties at head office, where Mr. Gledhill, chairman and joint managing director with Mr. Cumming, will also be in attendance.

* * *

Refrigerating Plant

Although working to full capacity on the manufacture of refrigerating plants and almost wholly for Government contracts, Ernest West and Beynon, Limited, still make some licensed commercial plants, while their outdoor service is maintained despite difficult conditions. The company is now largely concerned with small machines and these are made to exacting specifications which will have an influence on post-war products and enhance the high reputation it already possesses as old-established builders of refrigerating machinery.

* * *

New Fat-from-Wood Process

German chemists have discovered a process for producing fat and protein for feeding purposes direct from wood cellulose instead of passing through sugar as an intermediate stage, says the German radio. A number of factories are already being built to carry out the process. The discovery of a process for the synthetic production of vitamin D has also been announced.—*Reuter.*

* * *

63,000,000 Dozen Eggs

Egg consumption in Canada today is the highest ever known, said J. F. Haggerty, representative of the Special Products Board, poultry division, during a brief visit to Nova Scotia. Canada's contract with the British Ministry of Food calls for 9,000 gross tons of powdered egg this calendar year, which is the equivalent of 2,100,000 cases or 68,000,000 dozens.

Health Education in Jamaica

A Health Education Officer has been recommended for Jamaica. He will extend the activities of the American Rockefeller Foundation Bureau that was started in the island sixteen years ago.

* * *

Kenya Dries Bananas

Bananas in the Kiambu district of Kenya are being cut into strips, dried in the sun for three days and then ground into flour for bread-making. A bunch of bananas weighing about 40 lbs. produces approximately 3 lbs. flour.

* * *

Research Service

British industrialists seeking new means or lines of production for any kind of industry, also proprietors of new industrial developments, the American manufacturing rights of which they desire to license to suitable concerns in North America, may be interested in a research service in new industrial inventions which comprises the selection, investigation and submission of proposals to the requirements of customers. For the operation of this service the Pilot Industrial Trust, Limited, has associated offices in San Francisco, New York and Buffalo and agents throughout the United States and Canada, and, in London, an advisory staff of engineer-consultants, patent counsel, solicitors and accountants.

* * *

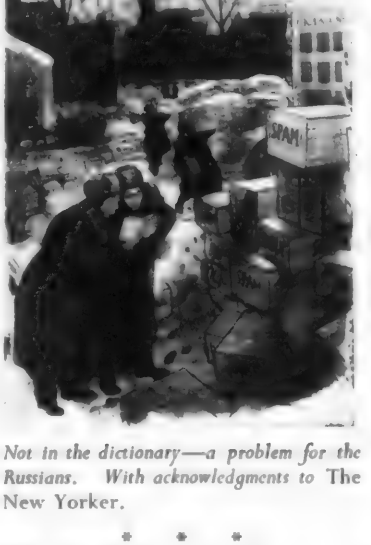
High Protein Diet for Airmen

According to Lieut. Howard R. Bierman, Medical Corps, U.S.N.R., a high protein diet appears ideal for the aviator. The relatively slow breakdown of the food proteins provides a more lasting source of nourishment and serves as a sizable source of carbohydrate, as well as amino acids. The specific dynamic action of proteins may be of particular value to the high altitude aviator in aiding the temperature-regulating mechanism of the body so necessary at the colder temperatures experienced above 10,000 ft. The use of the extra heat-producing action of proteins in maintaining body temperature appears to be a valuable adjunct to the diet.

Wild Deer to Go

Thousands of America's wild deer, elk and antelope may be slaughtered for food. This is one of the suggestions made by the grazing service to add 152,000,000 lbs. of meat to the nation's larder. Another suggestion is that Western rangelands should be more efficiently used. More than 100,000 elk, deer and antelope graze on Federal rangelands. They would be thinned out carefully so as not to destroy the herds.—*Reuter.*

* * *



Not in the dictionary—a problem for the Russians. With acknowledgments to The New Yorker.

* * *

Diseases of Dairy Cattle

The Ministry of Agriculture wishes once again to draw the attention of farmers, particularly dairy farmers, to the importance of seeking veterinary aid for the treatment and control of disease in their herds. Even if a farmer is not prepared for one reason or another to accept the Dairy Cattle Diseases Control Scheme, with its comprehensive facilities for the control of contagious abortion, sterility, mastitis and Johne's disease, he should nevertheless take full advantage of the services of his veterinary surgeon.

At the first sign of trouble in his dairy herd the farmer should call in his veterinary surgeon. The results of wrong treatment may be just as serious as no treatment at all.

West Indian Canned Food Industry

The appointment of a canning officer, to supervise the developing tinned food industry, has been approved by the West Indian Governments.

* * *

Food Research in Trinidad

The Low Temperature Research Station in Trinidad is investigating the storage and transport problems of all the perishable products of the West Indies. Field experiments are also to be extended to all vegetable and food crops.

* * *

Powdered Liver Prepared

Chemists in the United States Department of Agriculture, in cooperation with one of the large packing companies, have developed a method of reducing liver to a fine brown powder, which can be preserved indefinitely without refrigeration and takes up only about a fifth of its original space. Hitherto it has been possible to send liver abroad, or even to the domestic market, only by keeping it continuously frozen. Now it is reduced to a liquid by treating it with papain, and the water is removed by means of a vacuum spray drier. The water can be restored as wanted, or the powder can be mixed with other materials for cooking.

* * *

Ulster Canned Goods and Jam

Some idea of how Ulster canning and jam manufacturing concerns are helping the war effort was given in reports submitted at the council meeting of the Ulster Industries Development Association.

It was revealed that all the canning concerns—seven in number—are now working on a standardised allocation basis to fulfil Ministry of Food and Service as well as civilian contracts for soups, meat and vegetable canned goods.

The output of jam was reported to have considerably increased with the prospect of still greater production, as a result of arrangements being considered with the Ministry of Food, which it was hoped would satisfy all legitimate consumer demands.

Bakehouse Waste

A number of bakers are evidently still in doubt as to the correct method of disposing of flour sweepings, sack shakings and bakehouse waste, and the disposal of these products.

Flour sweepings and sack shakings may only be sold to authorised manufacturers of compound and mixed animal feeding stuffs, either direct or through licensed dealers, for the manufacture of feeding stuffs for livestock. Flour sweepings and sack shakings may not be sold except under licence for any other purpose—*e.g.*, they may not be sold direct to a consumer or used in the manufacture of dog foods.

Bakehouse waste, other than flour sweepings and sack shakings, may, however, be sold direct to consumers or licensed dealers of feeding stuffs.

* * *

Control of Starch and Dextrine

In order to make the most effective use of the starch and dextrine available in the United Kingdom, it has been found necessary to extend the existing control over these products. Up till now the control covered the sale and purchase of all starches and dextrines, but the use of only certain starches and dextrines. In future control will extend to the use of all of them except for defined domestic purposes. Traders will be required to keep records of usage in addition to records of dealings, except when the goods are used for domestic purposes.

The Minister of Food has therefore made a new Order—the Starch and Dextrine (Control) Order, 1943—which replaces the existing Control Order, S.R. & O. 1941, No. 1991, as amended by S.R. & O. 1942, No. 788.

The new Order covers, in addition to the dextrines named in the old Orders, the substance known as "Thin Boiling Starch", and includes Arrowroot in the definition of "starch".

Under the new Order there is a statutory obligation on traders to keep records of uses (other than domestic) of starches and dextrines and on holders of licences and authorisations under the Order to comply with the terms of them.

The new Order came into force on April 25, 1943.

More Sugar from Cane and Beets

American scientists claim to have found ways of extracting more sugar from cane and beets without increasing the crops. The American Chemical Society is studying the process, which uses a synthetic resin, known as amberlite, to remove impurities.—*Reuter.*

* * *

Concentration of the Biscuit Industry

Within recent months the tonnage output of biscuit manufacturers has shown a steady decline, and the reduced level of production is now approaching the global target fixed for the industry in accordance with the Government's policy for saving labour and ingredients such as flour, oils and fats, sugar, etc.

The Ministry of Food has, therefore, decided that the time is opportune for the application of the concentration proposals which have recently been agreed with the industry, following negotiations between the Government Departments concerned and the manufacturers. The scheme provides for a reduction in the total output of biscuits to a figure little more than half of what it was twelve months ago, and with certain exceptions will entail a proportionate reduction in the quantity manufactured by each individual factory. The exceptions concern those factories located in areas where man-power demands are most acute. These will be subjected to a more severe limitation of actual production, but the resulting deficiency in tonnage will be made good by factories situated where labour is more readily available.

Biscuits for the services will be a first call upon the quantities produced, and consequently the tonnage for civilian use will be considerably below the consumer level of the summer of last year. In view of the process of gradual reduction which has been adopted there should be no sudden scarcity, but progressively biscuits will be more difficult to obtain. At the same time plans are being made to ensure that all parts of the country have a reasonably equal share in the reduced quantities available.

Grain-Drying Stations

Grain-drying stations are to be built on sites already selected throughout Britain under a scheme in which the Ministry of Agriculture and the Ministry of Food will be associated. At the centres will be accommodation for the storage of dried grain. The Ministry of Food will buy grain from farmers, and it will be treated so that it keeps without deterioration until it is required. British-grown corn contains far more moisture than that which is grown in drier countries, and hitherto it has been left to the farmer, the merchant, or the miller to do what he could to make it fit for storage. The difficulties of doing so have in the past had a great influence in compelling the farmer to market his grain at times when he was not able to get the best price for it.

* * *

Empire Spices for the United Nations

Supplies of spices from British Empire sources are to be made available to Russia and the United States among other countries, said Mr. Claud R. Wickard, U.S. Secretary of Agriculture, recently. He was announcing the acceptance of the combined Food Board's allocation of cinnamon, mace, nutmeg and pimento available from the Empire.

The supplies available will be distributed among Canada, the U.S. other Western hemisphere countries, the U.S.S.R., the United Kingdom, and other Eastern hemisphere countries. The Board has set up an unallocated reserve for use in adjusting possible inequities in its allocations. Pre-war consumption of cinnamon and cassia totalled about 25,000,000 lb. a year and came largely from South China, French Indo-China, the Netherlands East Indies, and Ceylon. Supplies of cinnamon are now restricted to those from Ceylon, and of nutmeg and mace to those from the British West Indies.—*Reuter.*

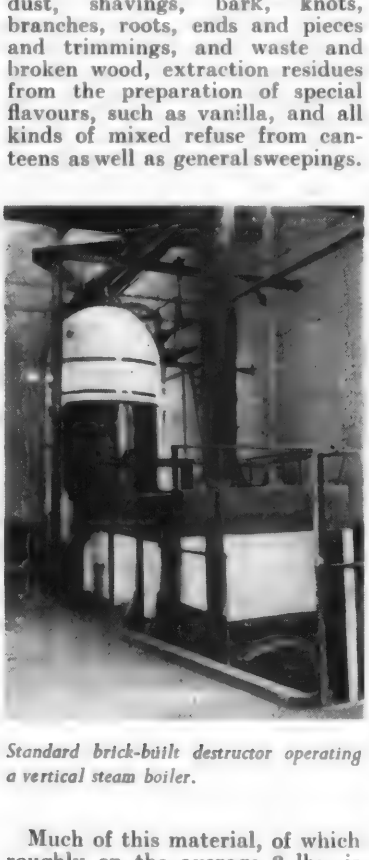
* * *

Food from Eire

Eire exported £934,504 worth of livestock to Great Britain in February, it was stated in Dublin recently.

Modern Industrial Destructors

Even under the conditions of the most complete salvage of material such as string, paper, cardboard, sacking, straw, and other fabrics, there is available an enormous amount of combustible refuse material, especially in the food industries. Included is seeds, skins, cores, stalks, and leaves, general sweepings, sawdust, shavings, bark, knots, branches, roots, ends and pieces and trimmings, and waste and broken wood, extraction residues from the preparation of special flavours, such as vanilla, and all kinds of mixed refuse from canteens as well as general sweepings.



Standard brick-built destructor operating a vertical steam boiler.

Much of this material, of which roughly on the average 3 lbs. is equal to 1 lb. of coal, is either deliberately wasted by being thrown on to dumps or ignited in heaps in spite of the nuisance caused, or is burned in crude and inefficient fashion, often in steam or hot-water boilers, for example.

There are no official figures concerning the amount of such material available, but it is very much larger than is generally imagined, and many thousands of tons of coal could be saved by adopting the correct methods.

Meldrums, Ltd., have specialised particularly on small and medium size destructor installations. For example, their standard steel case industrial destructor, used for almost every type of material, is available in 12 standard sizes, burning from 60 lbs. to 30 cwt. of mixed material per hour when using forced draught through steam jet or small self-contained electrically driven fan. These consist in basic principle of a neat rectangular steel casing with a fire-door at the front along with a charging aperture normally closed by a lid with balance weight, the casing being lined internally with firebrick and fitted with suitable fire bars, operating in conjunction with a short steel chimney. Suitable types of hot water or steam boiler are also available to operate along with the destructor, forming a self-contained unit.

* * *

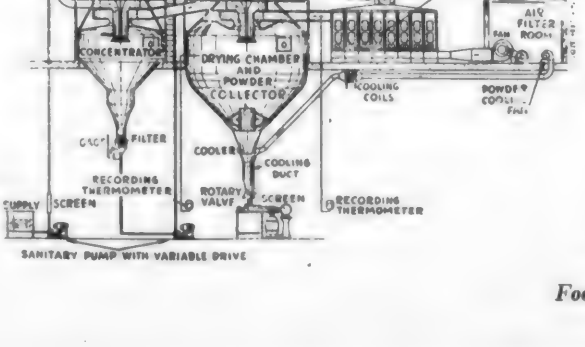
"Telescoping" the Sweet Industry

Thousands of workers and millions of square feet of factory space have been freed for other use by "telescoping" the confectionery industry.

Pointing this out recently, a Ministry of Food official said that no enterprise of the Ministry had worked more smoothly than sweet rationing. Less than 10 per cent. of the pre-war varieties of sweets were now being turned out, and packs used numbered 10 instead of 160.

The use of cocoa butter in toffees and other sweetmeats would mean an increase in the price of those toffees of a halfpenny to a penny per quarter, as the cocoa butter cost more than the oils and fats formerly used.—*The Financial Times.*

* * *



Synthetic Milk from Tallow

The Japanese are now using synthetic milk made from vegetable tallow, according to Tokyo radio. It was invented by Kenohi Iwamoto, former director of the Tokyo Research Institute, and is claimed to be 60 per cent. more nutritious than cow's milk and produced at a third of the cost. About 72,000 gallons a month of this synthetic milk in powdered form is being produced in large Japanese towns.

* * *

New Mixing Process for Dehydration

A new mixing method, said to meet all the requirements of a good dehydrating process, has been developed by the Drying and Concentrating Company, Chicago, Ill.

Maximum mixing between product and heated air is accomplished by a centrifugal-type spray head. The product being dehydrated is pumped into the concentrator by a sanitary pump. The discharge from the concentrator is pumped to the top of the drying chamber by a second sanitary pump, and is discharged into the chamber through a centrifugal spray head into the heated air which is whirling at high velocity. A quick, thorough and uniform mixture results, causing the moisture to be evaporated from all particles of the product uniformly and almost instantaneously.

No special collection chamber is necessary with the dehydrator. Because of the high velocity of the spiraling action within the dehydrating chamber, the powder formed by dehydration is hurled against the sides of the chamber by centrifugal force, and drops down to the lower part of the dehydrating chamber, which thus acts as a collector.

Institute of Fuel

The Council of the Institute of Fuel at their last meeting unanimously elected Dr. E. W. Smith, C.B.E., D.Sc., F.I.C., M.I.Chem.E., President of the Institute for 1943-44. He will take office in October next.

Dr. Smith has been well known in the fuel world for many years, having been Chief Chemist at the Birmingham Corporation Gas Department for several years before becoming Technical Director of the Woodall Duckham Companies some twenty years ago.

In 1941 he was appointed by Sir Andrew Duncan, then President of the Board of Trade, as Director-General of Gas Supply, which position he continued to hold when the Government interests in the gas industry were transferred to the new Ministry of Fuel and Power. Having completed the work for the Government that he had undertaken to do, he resigned his position with them a few weeks ago.

His position as President of the Institute will be cordially welcomed by all those connected with the fuel industries.

* * *

Workers Canteens and Staff Shortage

In the matter of service of meals to war workers our main difficulty to-day is the acute shortage of staff, Mr. George Beardsworth, J.P., of the National Union of Distributive and Allied Workers, and chairman for the ensuing year of the National Joint Council for the Industrial Catering Trade, stated recently:

"The service of meals is suffering, and complaints are coming from the workers because we are not provided with adequate labour. We hope the Minister of Labour will remedy this condition before it becomes worse as it threatens to do at a stage in the war when the way in which the workers are fed in their canteens will be of vital national importance."

On behalf of the employers' side, Mr. Harold L. Gardner, chairman of the National Society of Caterers to Industry and vice-chairman of the N.J.I.C., endorsed Mr. Beardsworth's comments.

OBITER DICTA

- A grower in relation to any rhubarb includes any person in whom the property in the rhubarb is vested before the severance thereof from the land.—*Ministry of Food.*
- The system of house charges in restaurants is nonsense.—"*Tatler.*"
- Ben Tillett must be assigned a place within the inner circle of those Captains of the Industrial Army, who have earned the applause and gratitude of hundreds of thousands of their fellow-citizens.—*Lord Sankey.*
- Friction is healthy, and is widely and almost universally dispersed.—*The Prime Minister.*
- The Department of Agriculture for Scotland rat squad (twelve catchers) accounted for 100,000 rats in 1942. A rough estimate of the saving in food value is £150,000.—"*The B. and G. Review.*"
- I think it is not at all surprising if someone goes and buys a cake, and then finds she has one with a mouse in it, that she should complain.—*The Magistrate, in a recent food prosecution.*
- The only way to avoid prosecutions for offences in the distribution of food is to possess both the cunning of a "Philadelphian lawyer" and the honesty of an archangel.—*A speaker at a recent Co-operative Party conference.*
- I'd like to ask you as engineers, "Is there a correct sponge fermentation time for any given flour?"—*J. M. Doty, at the twentieth annual meeting of the American Society of Bakery Engineers.*
- I agreed with the suggestion put forward by the defence that lime was the same substance as calcium, in a chemical sense, and was good for teeth and bone. I also agreed that it was not injurious to public health.—*Sampling Officer in a Police Court summons at Dartford, Kent.*
- How can we expect our people to keep really fit in a time of stress like the present on a vegetable diet? It is idle for the authorities to tell us that the country was never more healthy, because if this is so, why are the doctors so extremely busy at present?—"*The Statist.*"

Location of Industry (Restriction) Order, 1941

In reply to a request by Mr. Bowles (Lab., Nuneaton) to the President of the Board of Trade to state the reason for the extension of the Location of Industry Order to cover premises below 3,000 square feet in area, Mr. Dalton stated that under the Location of Industry (Restriction) Order, 1941, the starting up of any form of production in premises of 3,000 square feet or over in area, or a change-over in the type of production carried on in such premises, was subject to the issue of a licence by the Board of Trade. With the progress of the war it became essential to cover all premises, whatever their size, so that there should be no waste anywhere of our resources, whether of space, raw material or labour. Accordingly, following consultation with the Ministry of Production, an Order was made in October last abolishing the exemption of premises below 3,000 square feet in area and thus bringing within the Department's control all premises, whatever their area. The Order is administered in close consultation with the Regional Boards of the Ministry of Production.

The Order also governs the use of premises for storage purposes.

* * *

Letter to Oil Distributors

Mr. A. Franks, Chairman of the Oil Distributors' Emergency Council, has sent the following letter to Oil Distributors throughout the country:

"It is the policy of the Government resolutely to push the reclamation of waste oil.

Distributors can, and must, render every assistance possible to further this purpose.

I herewith submit to you a few suggestions that may be helpful to you in carrying out a campaign.

1. Contact should immediately be made with your large consumer customers to ascertain what facilities they have for dealing with waste oil.

2. Ascertain if a reclamation plant is in use; if so, obtain details.

3. Elicit what quantity is put through the plant.

4. Find out whether the reclaimed oil is used again or disposed of. If the latter, to whom.

5. Where no reclamation plant is in use ascertain what is done with the waste oil. It may be that it is just dumped. If so, details should be sent to the Lubricating Oil Pool, who will give the necessary advice as to its disposal.

6. Any information regarding kerosene used for cleaning which is not being recovered would also be of value.

As you are aware, the use of cutting oils and soluble oils has considerably increased since the outbreak of war, and this particular branch of the industry needs special investigation. There is evidence that no attempt is made by many consumers to recover this class of oil from the swarf. I should appreciate all information you can give me on this part of the industry.

The Lubricating Oil Pool advise me that the matter is of the greatest possible urgency; therefore, I rely upon you to take immediate action."

* * *

Crosse and Blackwell, Ltd.

The twenty-third ordinary general meeting of Crosse and Blackwell, Ltd., was held recently, Sir Frederick Eley, Bt. (the chairman), presiding.

The following is the chairman's statement which was circulated with the report and accounts and taken as read:

The balance-sheet, as usual, has been drawn up in a simple and comparative form and speaks for itself; we are pleased to say it discloses a still improving financial position.

The capital expenditure and provisions of the past in bringing our factories and equipment up to date have borne good results; and savings, subject to the increased labour costs, have been effected in the various departments and sales organisation, which latter important section will need to be built up again when normal conditions return.

Our factory capacity has been fully utilised—largely on Government work; and, as stockholders are aware, purchases of raw material and sales of the principal finished products are subject to the control of the Ministry both in price and zone distribution.

The directors are pleased to report as having an important bearing on the future financial position of the company that the whole of the 6½ per cent. debenture issue has been redeemed and replaced by a banker's loan of £600,000 at 4½ per cent., as shown in the balance-sheet.

* * *

Packaging Research

An excellent response to the recommendations put forward by the Packaging Research Committee has been forthcoming, and sufficient support has been obtained for packaging research to allow the scheme to go ahead. About 100 firms have already joined, and an annual income of over £5,000 from trade sources has been obtained. To this will be added a substantial grant from the Government, which matter is at present under negotiation.

As from April 1 last, the Council of Patra, at the invitation of the Packaging Research Committee, formally assumed responsibility for the work, and the following have accepted an invitation to a seat on the Council as representatives of the packaging interests:

Mr. L. R. Armstrong, British Cellophane, Ltd.
Mr. A. D. Budd, British-Amer. Tobacco Co., Ltd.
Mr. T. W. Carron, Thames Board Mills, Ltd.
Dr. C. H. Clarke, Lever Bros. and Unilever, Ltd.
Mr. E. Heilbron, Saml. Jones and Co., Ltd.
Mr. H. Rutherford, Venesta, Ltd.
Mr. G. W. Severn, Horlicks, Ltd.
Dr. G. W. Worrall, I.C.I., Ltd.

Additionally the following members of the Council, of some years' standing, represent firms who are also subscribing to packaging research:

Mr. A. Baker, Edward Lloyd and Co., Ltd.
Mr. F. L. T. Barlow, Wiggins Teape and Co., Ltd.
Mr. W. L. Bemrose, Universal Printers.
Mr. R. G. Connell, The Metal Box Co., Ltd.
Mr. J. W. Randall, John Dickinson and Co., Ltd.
Mr. A. Ralph Reed, Albert E. Reed and Co., Ltd.
Mr. A. E. Watts, Johns, Son and Watts, Ltd.

The Packaging Research Committee is now considering the question of the administrative machinery necessary to prosecute the research and the composition of an Advisory Panel. Recommendations on these matters will be made to Patra's Council at an early date. The functions of the Panel will be to advise the Council of Patra, through its Research Committee, on the programme of research to be undertaken and to supervise the progress of the work.

Members of the research staff of Patra who will be concerned with packaging problems are making a start with the necessary preliminary of contacting members to find out what are the practical problems of the package user and producer.

Many important firms of both package users and package producers are supporting the research, including well-known food manufacturing concerns.

* * *

Air Transport and Food Supplies

Mr. Howard R. Tolley, Chief of the U.S. Bureau of Agricultural Economics, in a speech at the Institute of Post-war Reconstruction in New York recently, said:

"Commercial air transport after the war may well be an increasingly important means of bridging the gap between ill-fed peoples in all parts of the world and nutritious food produced in abundance elsewhere. Developments in dehydration fit right into that scheme of things. It was to be hoped that after the war all the united nations would embark on a programme of full employment and adequate diets for all. That will mean modifying our restrictions against international trade in food and fibre. It will mean shifting our emphasis from what must we keep out to what can we trade in; from how little of this can we let in, to how much can we take."

To provide all the world's people with a diet considered adequate by nutrition experts the U.S. would require a 300 per cent. expansion in world production of fruit and vegetables, 125 per cent. increase in milk and other dairy products, 125 per cent. in vegetable oils, and 50 per cent. in meat and cereals.—*Reuter.*

Information and Advice

Sugar for Drained Peel

8,606. *Required, details of the latest position regarding the usage of sugar in the preparation of drained or candied peel for the inclusion of same in cake, etc. There is a Statutory Rule and Order, 1940, No. 1237, the Sugar (Restriction of Use) Order, which, while precluding the manufacture of candied peel or crystallised cherries, does not preclude the manufacture or preparation of drained or cut peel or glacé cherries. Is this still the position, or is the manufacture of the last-mentioned articles also forbidden now?* (Staffs.)

We have been informed that although it was perfectly legal to manufacture drained peel and glacé cherries in the Statutory Rule and Order quoted, since the original issue of this Order all licences have been withdrawn and, therefore, production of drained peel and glacé cherries is prohibited. According to the Ministry, there is now definitely no allocation of sugar for the manufacture of these products.

Asparagus Soup

8,691. *Required, details of manufacture of soup from asparagus stems. Should these be pulped?* (Kent.)

You are correct in your supposition that the asparagus stems should be pulped in the first place. The pulp should be mixed with an equal volume of stock. About 5 lbs. of fat added to 60 gallons. Thickening is effected by the addition of flour, and salt and pepper added to taste.

There are, of course, illimitable possibilities in the way of other additions, such as potatoes, etc.

Textbook on Flour and Flour Mixtures

8,706. *Required, a textbook on flour and flour mixtures. We write to ask your advice on the subject of which book you consider most suitable. We would like a book which will deal very thoroughly with flour and its reaction to blending with other ingredients, particularly raising agents. If the book started with wheat before milling and covered insect pests, so much the better, but as we do not employ a qualified chemist it would be necessary that the recommended book should use technical formulæ as little as possible.* (London.)

It is almost an impossibility to get all the information you require in one book, and we therefore are giving you the names of those books which should prove of value to you if used in their own particular section.

One book of exceptional value is *Modern Cereal Chemistry*, by Kent-Jones, but unfortunately no copies are available either new or second-hand in London, but it may be that you could borrow a copy from a technical library. This also applies to a book, *Leavening Agents*, by R. N. Hart (U.S.A.), and *The Chemistry of Wheat Flour*, by C. H. Bailey (U.S.A.).

A book available in its 1939 edition is *Bread Making*, by E. B. Bennion. The same author has just revised the second edition of *Cake Making*, which will give you some other technical information in this connection of aeration, fermentation and baking goods.

Another book, *The Microbiology of Starch and Sugars*, by Galloway, while dealing with the highly technical side, discusses the microbiology of cereals and cereal products, grain and its milling products, bran and flour, and the baking of bread.

On the subject of insect pests, there is one volume by William Clunie-Harvey and Harry Hill and another by H. Hayhurst.

You might also make reference to books on food analysis, such as Wynter Blythe's and Cox's book. *Chemistry and Cookery*; *Food, Health, Vitamins*; and *The Handbook of Experimental Cookery* might also prove useful for your purposes.

You would find a considerable quantity of information on individual items related to the subject which you are investigating throughout the bound volumes of FOOD MANUFACTURE and also *Food Industries Manual.*

Information Supplied

8,626. *Suppliers of second-hand slicing machines.* (Cheshire.)

8,627. *Manufacturers of flake machine plant.* (Herts.)

8,628. *Manufacturers of machine for filling puddings into tins.* (London.)

8,630. *Information concerning new Canned Meat Order.* (Staffs.)

8,631. *Firm likely to accept tableting work.* (Cambs.)

8,635. *Suppliers of a thickening agent.* (London.)

8,639. *Suppliers of factory type can openers.* (Lancs.)

8,642. *Suppliers of meat flavouring.* (Wales.)

8,643. *Manufacturers of extruding machines.* (Norfolk.)

8,644. *Information concerning bottled fruits.* London.)

8,645. *Manufacturers of fine wire meshing of stainless steel.* (London.)

8,647. *Manufacturers of machines for potato mashing, cutting, etc.* (Warwicks.)

8,648. *Suppliers of instrument for measuring vacuum in cans.* (Yorks.)

8,649. *Information concerning the manufacture of soups.* (London.)

8,654. *Suppliers of small paper soufflé cases suitable for trifles.* (Scotland.)

8,656. *Suppliers of beeswax.* (Sussex.)

8,668. *Names and addresses of the manufacturers of Smith's solder baths.* (London.)

8,677. *Information concerning* torula utilis. (Lancs.)

8,680. *Manufacturers of can openers.* (Leics.)

Information Required

8,707. *Suppliers of sodium propionate for use in foodstuffs believed to be sold under the trade name of "Mycohan".* (London.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Improvements in the Bottle Pasteurisation of Milk

In the bottle pasteurisation of milk the heat-sterilised bottles are fed from a washing machine to a filling machine where they are filled with milk and are then passed to a capping machine and from the latter to a hot-air pasteurising chamber through which they are traversed for 30 minutes at a temperature between 145° and 150° F., which are the legal limits of the pasteurising temperature.

The bottles are hot when they leave the washing machine but there is a possibility that in their passage therefrom to the filling machine their temperature may drop below the lower limit of the pasteurising temperature, and further whilst in the filling machine their surfaces may be slightly chilled due to cold air draughts and the consequent fall in temperature be transmitted to the milk. Moreover during the traverse of the filled bottles from the filling machine to the capping machine and from the latter to the hot-air pasteurising chamber the temperature of the bottles and of the milk therein may fall in temperature below the lower limit of pasteurising temperature even though the bottles and milk were not below such temperature on leaving the filling machine.

The object of the invention is the provision of means which will prevent any fall in temperature below the lower limit of pasteurising temperature of the bottles between the washing machine and the filling machine and of the bottles and milk between the filling machine and the capping machine and between the latter and the hot-air pasteurising chamber and also if desired of preventing any slight chilling of the bottles in the filling machine and/or the capping machine.

The hot bottles are conveyed between the several operative parts of the pasteurising plant by slat or similar conveyors travelling in enclosed or shrouded passages heated by suitable means such as steam or hot water pipes or electrical heating elements arranged at a suitable location within the enclosures whereby any fall in temperature during transit from one operative part of the plant to another due to radiation of heat from the bottles or from the bottles and the milk therein is prevented.

Suitable shroudings may also be provided at the various machines to prevent chilling of the bottles and milk during the various operations.

548,104. Arthur Guy Enoch.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

549,399. MATHIESON ALKALI WORKS: Treatment of starch for bleaching, sterilising, and other purposes.

549,403. AFRICAN SISAL AND PRODUCE CO., LTD., and NEWMAN, A. A.: Process for the manufacture of water-soluble vegetable colloid pastes or powders.

549,447. NATIONAL OIL PRODUCTS CO.: Treatment of fat-soluble vitamin-containing oils.

549,482. EDGEWORTH, K. E.: Cooking-ranges and domestic fireplaces, boilers, and stoves for burning turf.

549,504. LAMBOURNE, A.: Setting gauges for milling-machine operations.

549,571. SPENCE AND SONS, LTD., P., and KIRKHAM, A.: Protection of materials from attack by insect pests.

549,581. SMITH, A. E., and BLACKSTONE AND CO., LTD.: Elevators and like agricultural machines.

549,582. ROSENFELD, B.: Method of de-sulphurising beverages.

549,584. HARBER, L. S., and BAKER PERKINS, LTD.: Moulding of dough.

549,597. NAIRN, J.: Method of making Abernethy, digestive, and tea biscuits.

549,602. UNITED FRUIT CO.: Refrigerating system.

549,613. PHILIPS LAMPS, LTD. (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN): Preparation of concentrated edible products from invertebrates.

549,712. BRITISH CELLOPHANE, LTD.: Shredding apparatus, and methods of shredding fibrous material.

549,726. KENNEDY, D. S.: Apparatus for drying grain.

549,730. KLEEN, N. E. AF.: Control mechanism for absorption refrigerating apparatus.

549,740. DADANT, H. C., and GROUT, R. A.: Honeycomb foundation for bees.

549,741. STERN, R.: Method for preventing the formation of scale in steam boilers.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

LACOVO.—617,842. Powdered eggs and preparations of powdered eggs for use as food or as ingredients in food. **S. Zwick and Sons, Limited,** London Bridge House, 2, Tooley Street, London, S.E. 1; Egg and General Produce Merchants.

FLAVOMOND. — 620,698. Confectionery (not medicated), almond paste and marzipan. **William Wilson Brown,** 27, Ratcliffe Terrace, Edinburgh, Scotland; Manufacturer and Merchant.

TWO CARDINALS.—620,837. Tea, coffee, cocoa and chocolate. **Dominion Tea Plantation Co., Limited,** Dominion House, 30, Redcross Street, Liverpool, 1; Tea Merchants.

New Companies

H. Coleman (Borough Market), Limited. (377606.) 13a, Stoney Street, Borough Market, S.E. 1. To carry on bus. of dlrs. in vegetables, fruit, etc. Nom. cap.: £500 in £1 shares. Dirs.: H. Coleman, Hazels, Downe, Kent; H. J. Wildenberg, 5, Heatherdene, East Horsley, Surrey.

Neville and Sons, Limited. (377615.) To take over the goodwill and certain of the assets of the bus. of a greengrocer, fruiterer and fishmonger carried on as "Neville and Sons" at The Arcade, Walsall. Nom. cap.: £1,000 in £1 shares. Dirs.: F. K. Neville and Monica P. Neville, both of 25, Sutton Road; C. K. Neville, A. F. Neville, J. S. Neville and Doreen A. Neville, addresses not stated.

T. Watkinson and Son, Limited. (377642.) 68, Eastbank Street, Southport, Lancs. To carry on bus. of fish and oyster mchts., etc. Nom. cap.: £600 in £1 shares. Dirs.: T. Watkinson, Senr., Mrs. S. E. Watkinson, Miss B. Watkinson, all of Granville, Marshside Road, Southport; T. Watkinson Jnr., and Mrs. E. Watkinson, both of 103f, Cambridge Road, Southport.

Sid Pittman, Limited. (377670.) 1a, Rochester Walk, Borough Market, S.E. 1. To carry on bus. of wholesale and retail greengrocers, fruiterers, etc. Nom. cap.: £2,000 in £1 shares Dirs.: S. C. Pittman, Mrs. M. E. Pittman and S. F. Pittman, all of 7, Cathering Road, Surbiton, Surrey.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.